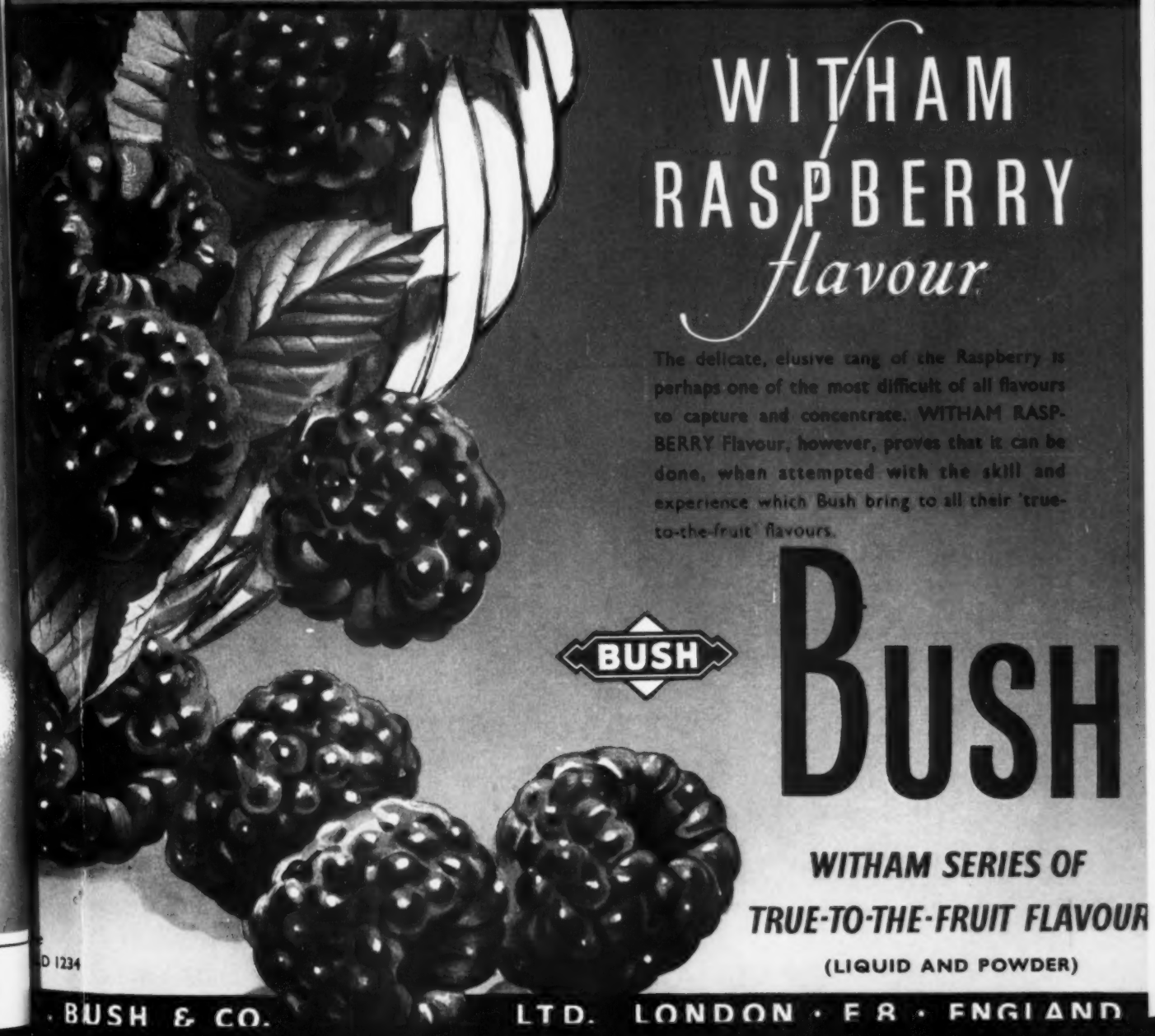
FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP NOVEMBER 1, 1957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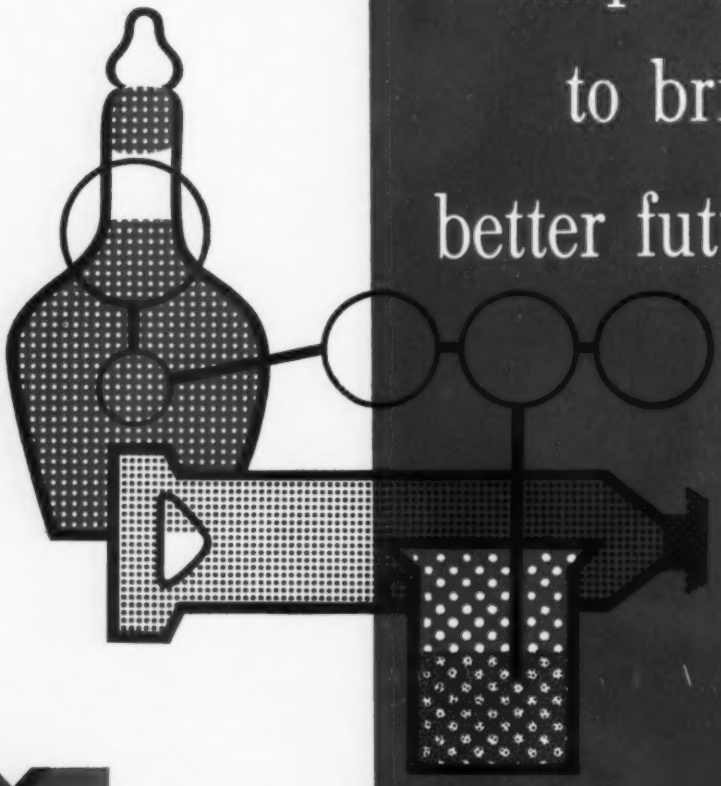

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- ★ **enables equal parts of meat and fat to be used because it is non-glutinous**
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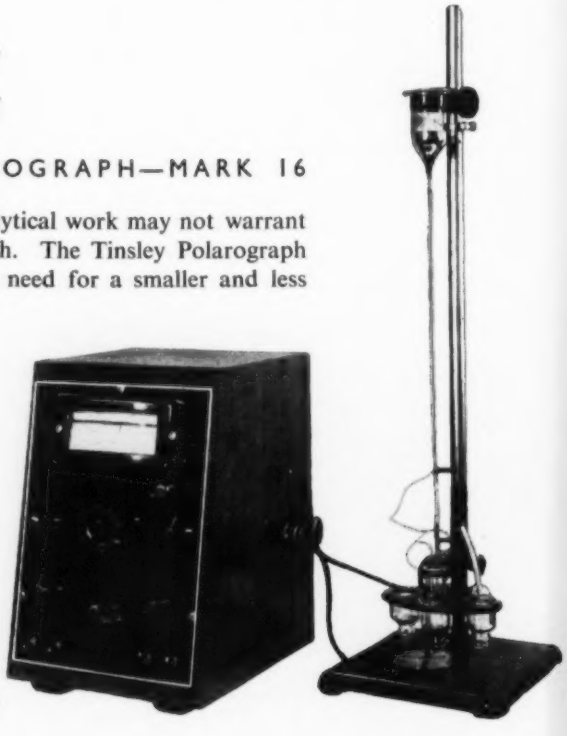

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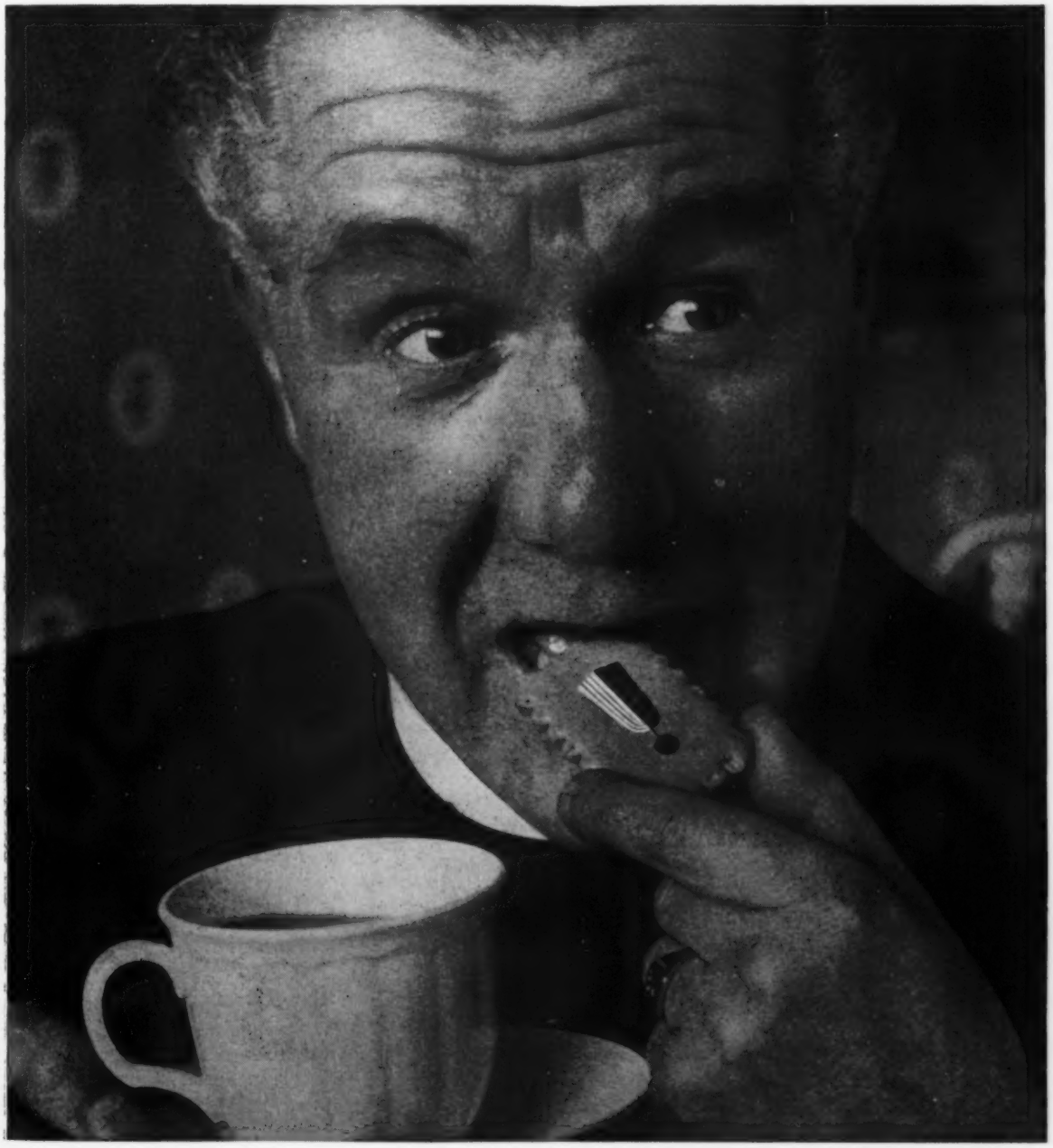

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VISKASE LTD. **also supply the famous Visking clear or coloured cellulose casings and fibrous casings for every class of cooked meat and sausage.**

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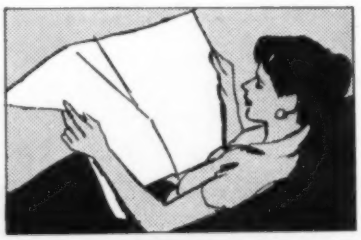
THE 1958
BRITISH FOOD

MORE PEOPLE THAN EVER will be there in 1958, for there'll be the biggest publicity ever to tell them about the Fair. Once again, the *Daily Express* is sponsoring the Food Fair, lending all its great publicity resources to excite public interest. The total circulation of the *Daily Express* group of newspapers is over 33½ million a week, all family journals, all featuring special articles devoted to women's interests. The 1958 Food Fair is going to be a bigger success than ever— thanks to the tremendous additional publicity that the *Daily Express* will be giving to it.

POWERFUL PRESS CAMPAIGN ——————→



Compelling advertisements in the National Press will invite everybody to Olympia for the Food Fair, remind everybody of the times and dates.

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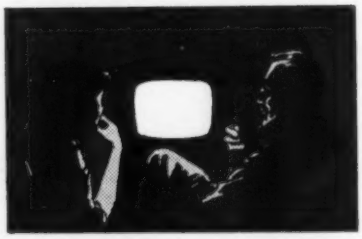

Millions will be asked along to the Fair in this great campaign.

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at every turn will send the travelling public on that rewarding extra journey to Olympia.

FAIR

GRAND HALL

OLYMPIA

LONDON

28 AUGUST

TO

11 SEPTEMBER

TRADE PREVIEW

WEDNESDAY, 27 AUGUST

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THE FOOD

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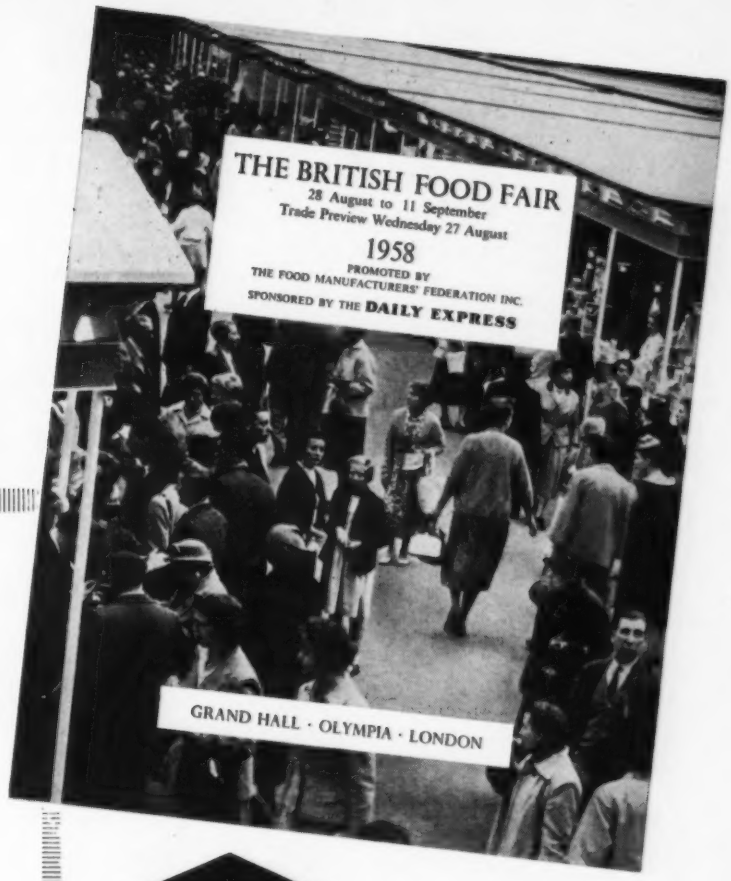
THE BRITISH FOOD FAIR
28 August to 11 September
Trade Preview Wednesday 27 August
1958
PROMOTED BY
THE FOOD MANUFACTURERS' FEDERATION INC.
SPONSORED BY THE DAILY EXPRESS
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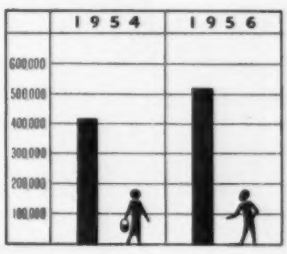
WRITE TODAY for a prospectus, which will give you all the details about costs, facilities — everything you will need to know about the 1958 Food Fair.
Send to: The General Organiser, British Food Fair,
10 Mount Row, London, W.1. Tel: LEGation 2933.

WHY YOU SHOULD BRING YOUR PRODUCTS TO THE FOOD FAIR. Higher living standards and bigger wage packets mean a more food-conscious public than ever before. That's why hundreds and thousands from all over the world, will be at Olympia in 1958 to **TASTE, TRY, AND BUY!**

UP AND UP GO ATTENDANCE FIGURES

407,412 visitors in 1954, and nearly 100,000 more in 1956. There's more interest than ever in the Food Fair. That's why it is the perfect opportunity for the manufacturer to meet the housewife, to note her requirements, answer her questions. And that's what gets her asking for his products in the shops.



THESE PEOPLE ARE YOUR MARKET — MEET THEM AT THE 1958 FOOD FAIR. MAKE SURE your stand is in the right position. Even now, with a year to go, sites are already being booked.

COMMER

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with 'full-view' 3-seat comfort cabs and optional overdrive

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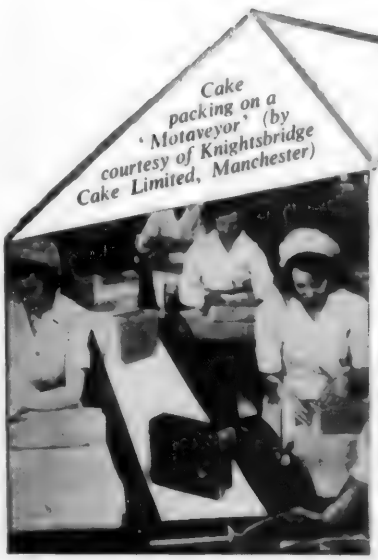
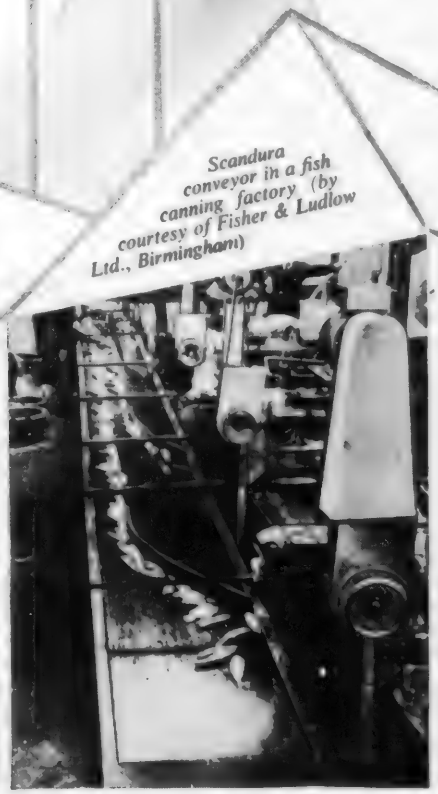


Cake packing on a 'Motaveyor' (by courtesy of Knightsbridge Cake Limited, Manchester)

Fruit bottling on a 'Motaveyor' conveyor (by courtesy of J. Mawdsley Ltd., Wigan)



Scandura conveyor in a fish canning factory (by courtesy of Fisher & Ludlow Ltd., Birmingham)

As the pioneers of P.V.C. covered conveyor belting British Belting & Asbestos have supplied their SCANDURA belting for many varied applications. Due to its resistance to contamination and its hygienic qualities SCANDURA has become the obvious choice for food conveyor belting. Its lasting qualities had already been proved in food factories two years before its first introduction in Britain's coal mines in 1948, and its fire resistant properties have brought a hitherto unknown safety margin where conveyor fire hazards originally existed. SCANDURA is available now, in varying widths and thicknesses to suit all applications.

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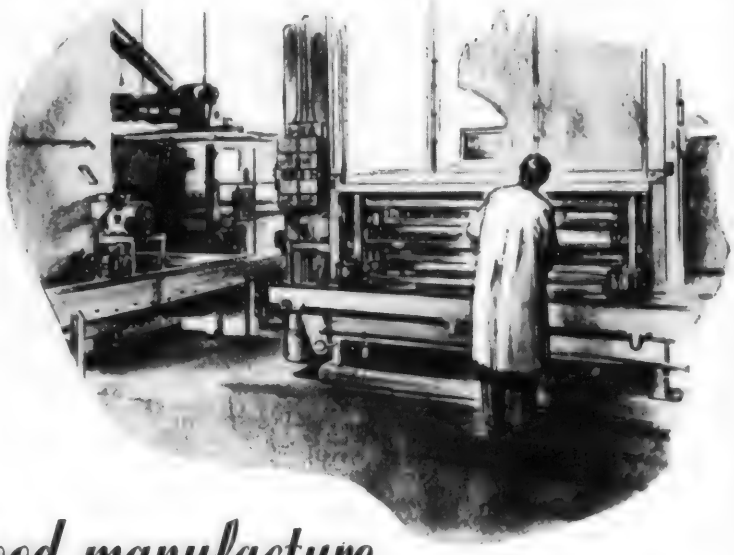

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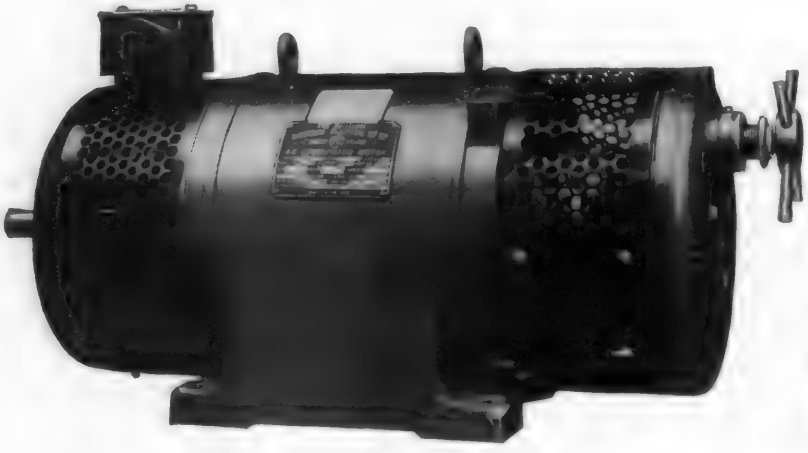

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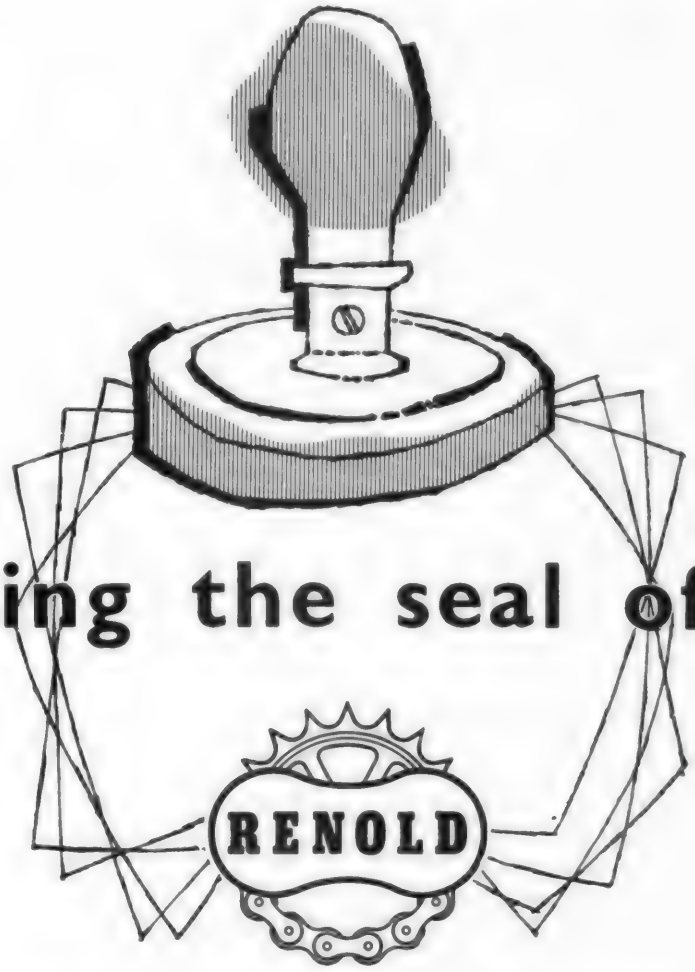

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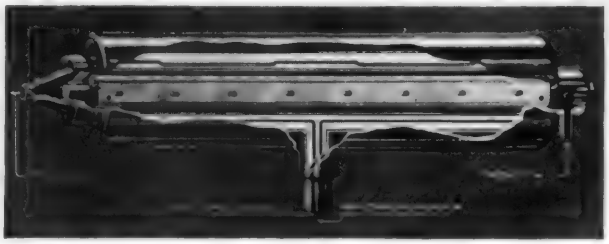

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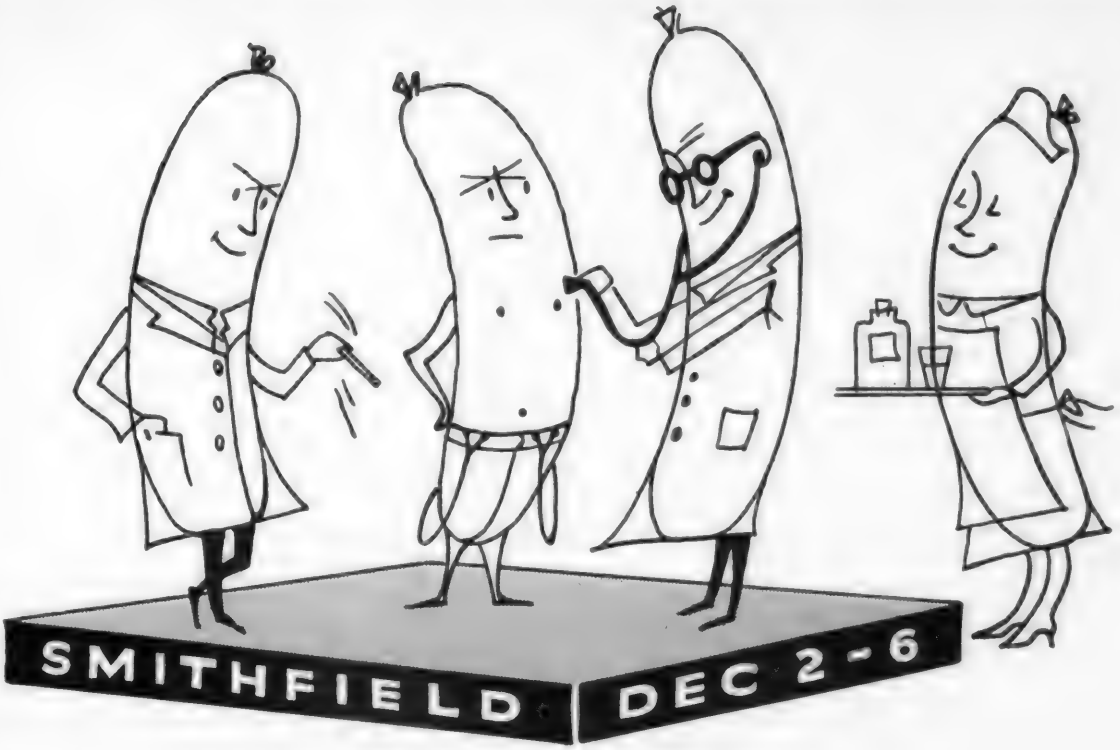

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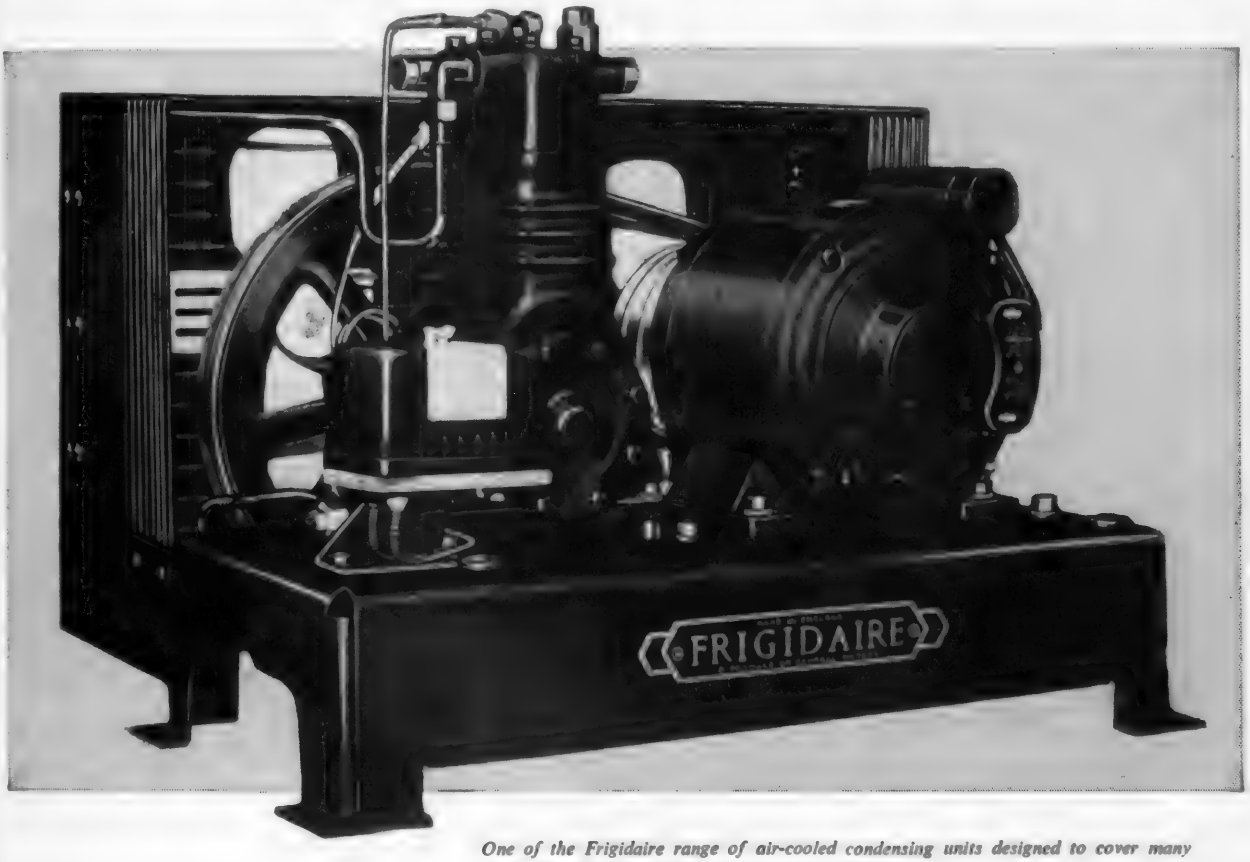

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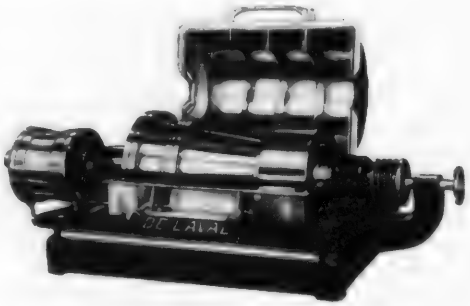

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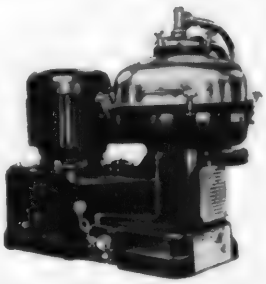

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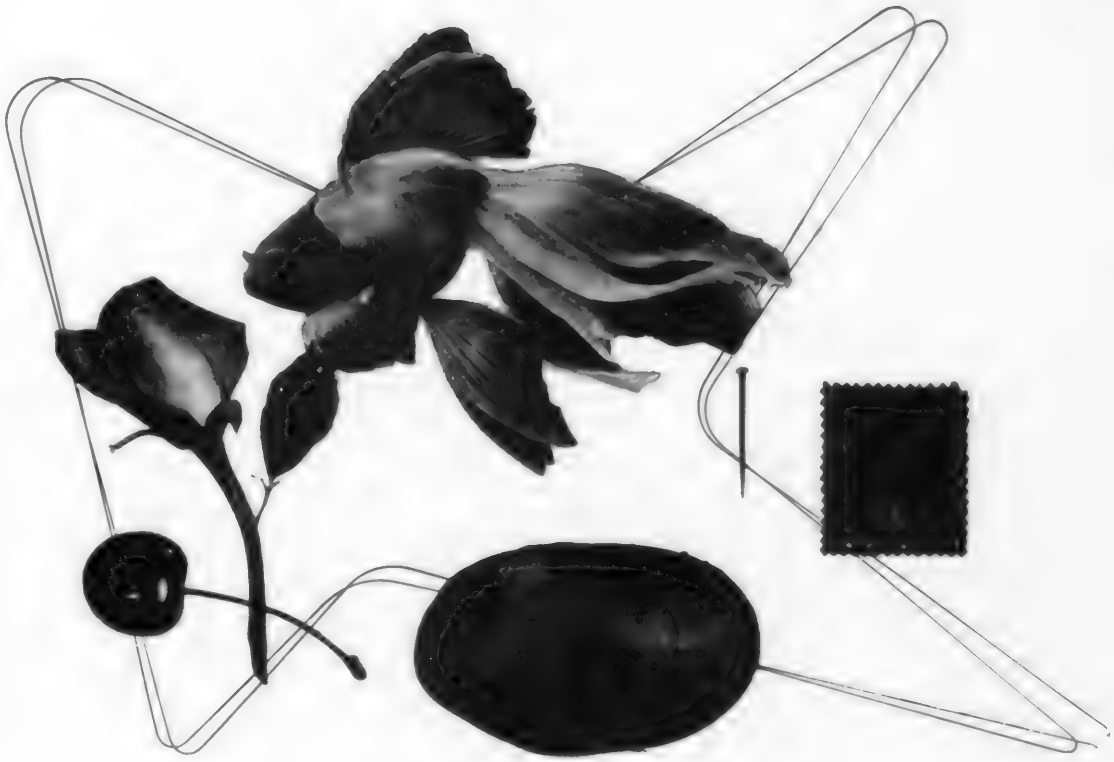

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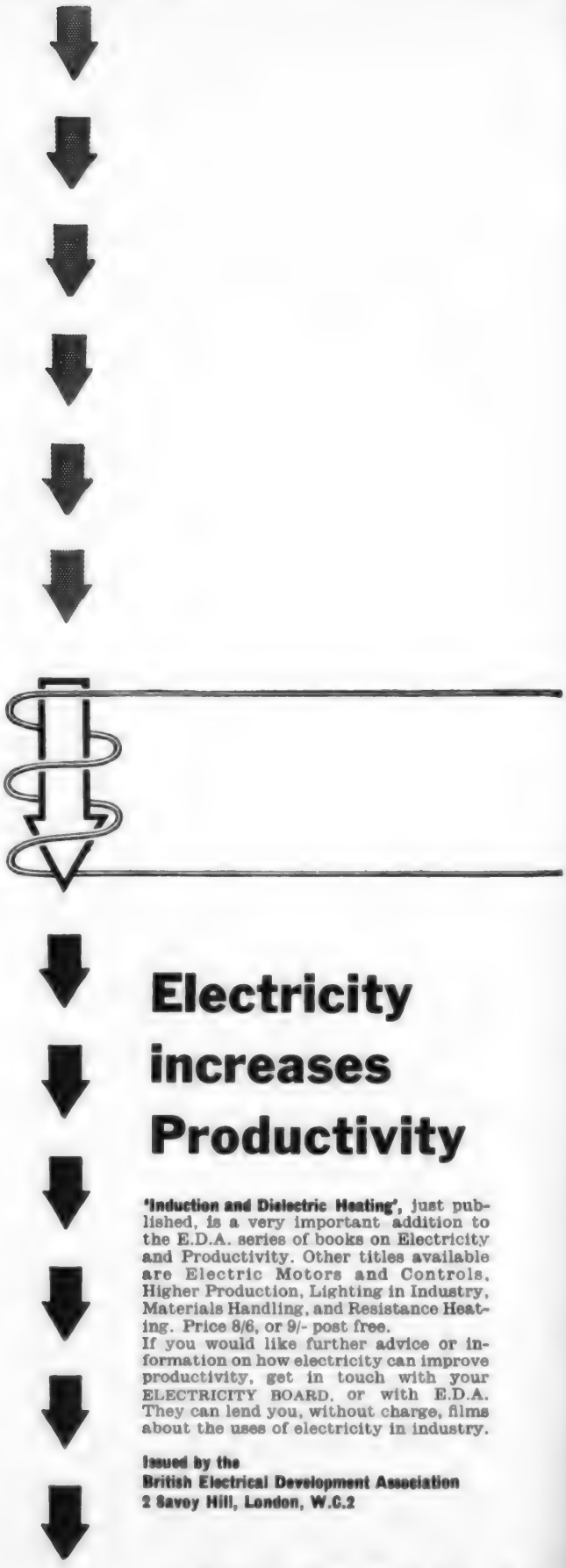

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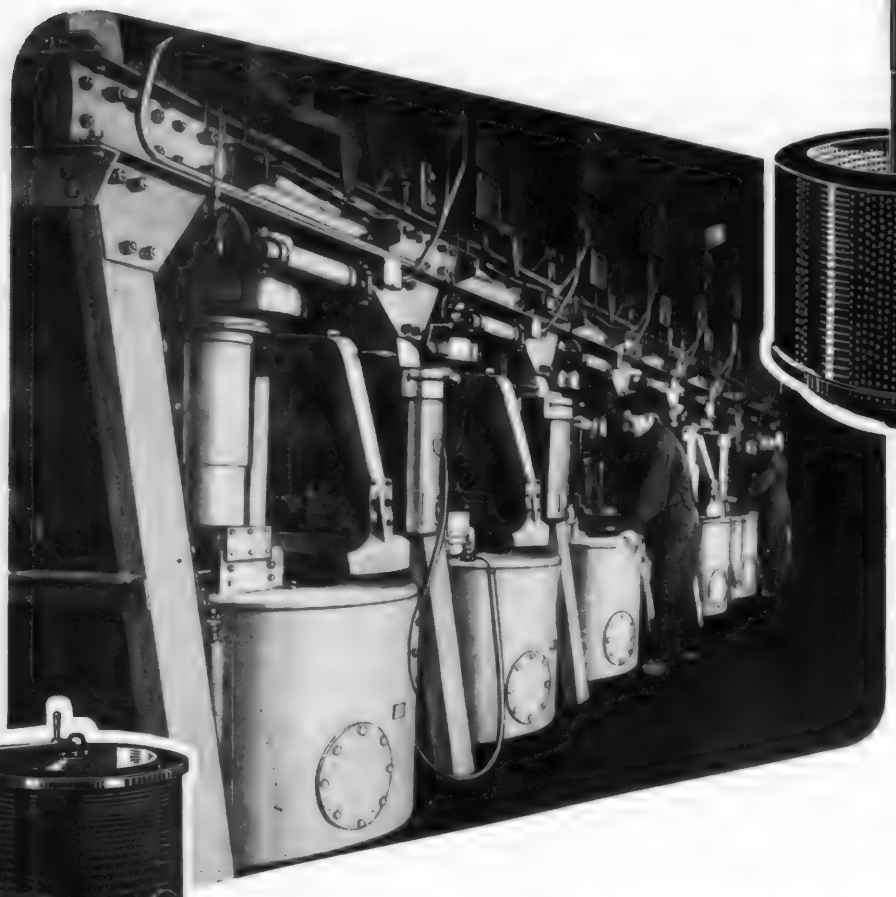

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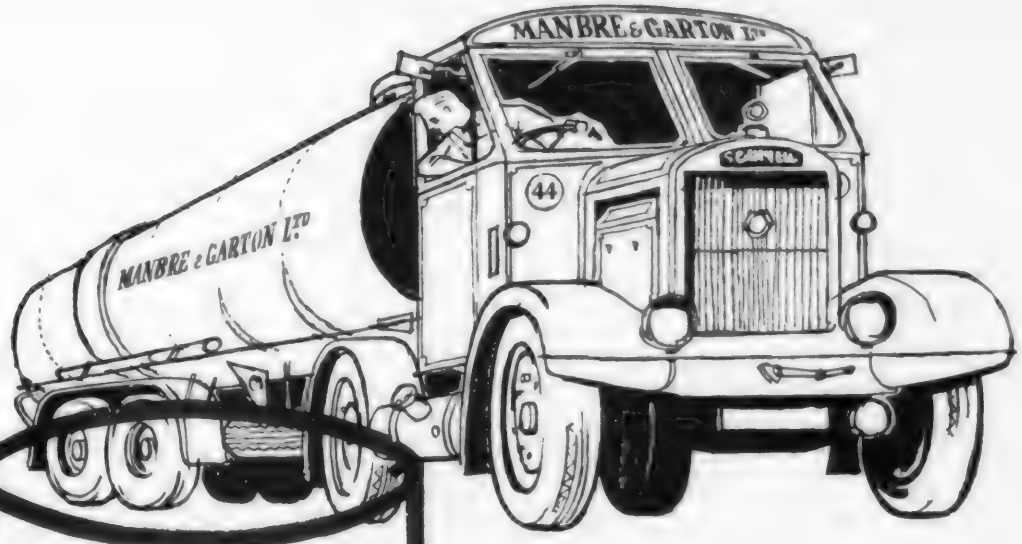

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As acknowledged experts in the field of food flavouring it is possible that we have the answer to your immediate flavouring problem. If not, the Boehm Experimental Kitchen will get to grips with it and do its best to find a solution. This service is absolutely free and, needless to add, is becoming more and more popular with manufacturers. Incidentally, many products today owe a great deal to the shrewd advice and technical help of Fredk. Boehm Ltd. Why not put your problem in the post to them NOW?

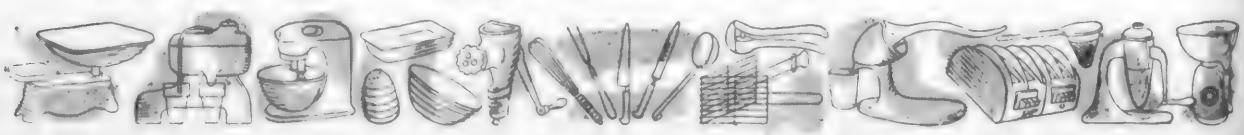
FREDK. BOEHM LTD.,
CONTINUES TO SUPPLY

AJI-NO-MOTO
Mono-sodium glutamate 99% pure.

YEATEX
Autolysed Yeast Extract.

PROTEX
Hydrolised Protein.

FREDK. BOEHM LTD., 19 BENTINCK STREET, W.1 Telephone WELbeck 7933



THE CHIEF ENGINEER says—

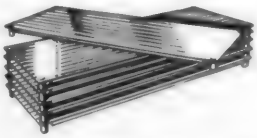
WARCO produces the largest and strongest pressed containers

★ Range now includes

★ Cat. No. B27189.
: 27¾″ x 18¾″ x 9″—14 s.w.g.

★ Cat. No. B271811.
: 27¾″ x 18¾″ x 11″—14 s.w.g.

★ Cat. No. B271814.
: 27¾″ x 18¾″ x 14″—12 s.w.g.



Heavy Duty Container

These strong, one-piece seamless deep-drawn containers manufactured in aluminium alloy, are without dirt-traps and are absolutely HYGIENIC—in fact, ideally suited for the Transport and Storage of Foodstuffs. The container is "stepped" to permit a valuable saving of 50% of its volume—when nested empty. With lids of 14 s.w.g. aluminium alloy, the containers will stack.

★ *Lids should be specified, if required, when ordering.*

★ *Anodised Finish, and Embossing are also available.*

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ENGLAND

First Choice for Aluminium Equipment

WARWICK PRODUCTION COMPANY LTD

A member of the ALMIN GROUP

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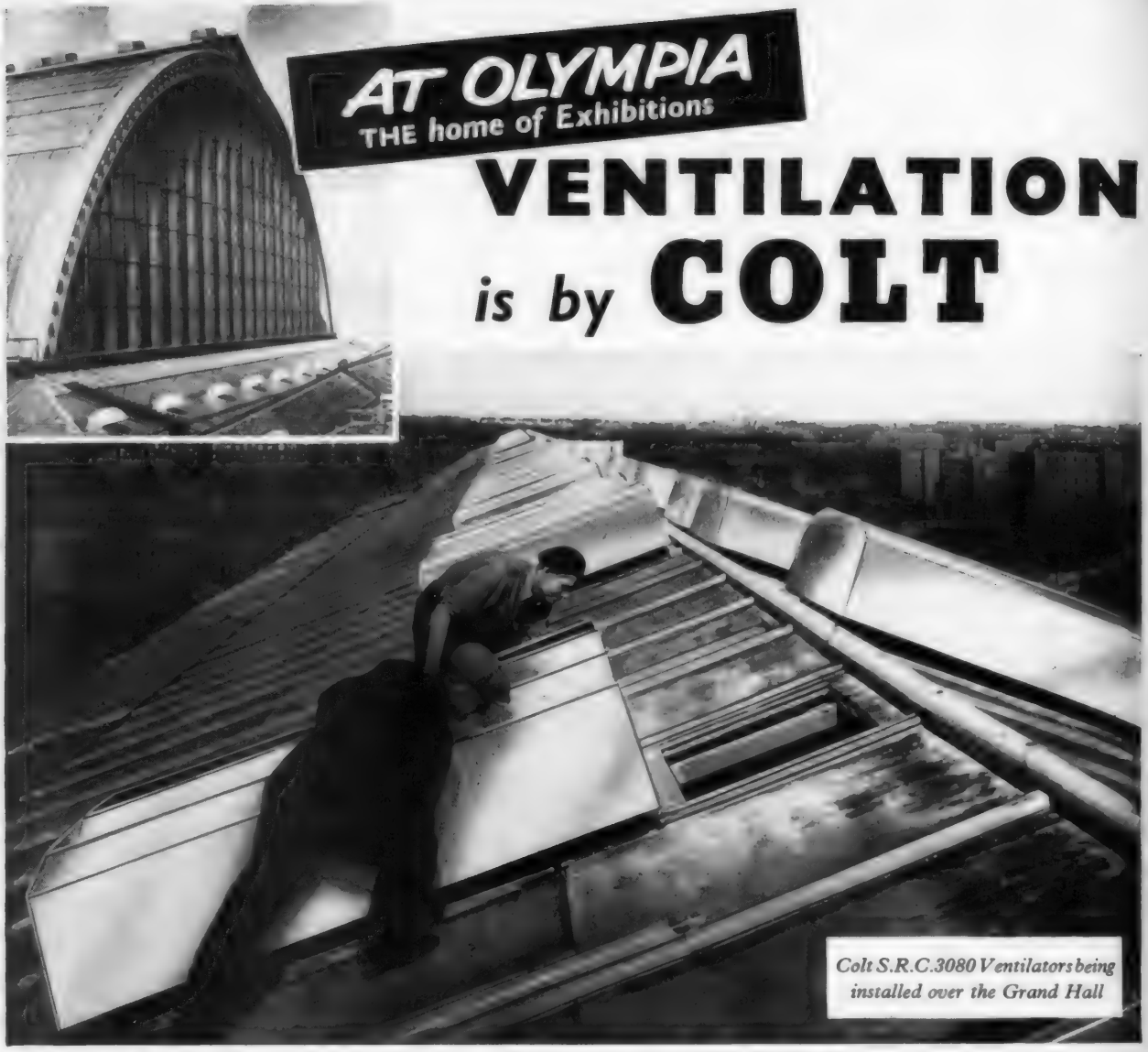

VENTILATION is by COLT

Colt S.R.C.3080 Ventilators being installed over the Grand Hall

Modern Exhibition techniques—involving the use of more and more artificial lights—together with an ever-increasing throng of visitors to Olympia's famous Grand Hall brought ventilation problems in their wake. A speedy solution with the minimum of inconvenience was essential, so Colt were consulted. Within two weeks, Colt submitted a comprehensive scheme, based on the extensive records available and on the information gathered during their thorough site survey. 60 Colt S.R.C./3080 Natural Extractors were installed astride the Grand Hall roof. These increased the extraction rate from the Hall by over 25,000,000 cubic feet of overheated stale air per hour while Colt Powered Inflow Units replaced this with sufficient fresh air to ensure a pleasant atmosphere under the most crowded conditions. The Olympia scheme is typical of the studied attention Colt give to every ventilation problem, large or small. Take advantage of their practical experience gained from over 50 thousand successful installations—let Colt solve YOUR problem.

Send for Free Manual on Colt Ventilation to Dept. V 20/11

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U.S.A. Subsidiary: COLT VENTILATION OF AMERICA, INC., LOS ANGELES. Branches throughout the country. Agents throughout the world.

SEE US ON STAND 127/8G BUILDING EXHIBITION · OLYMPIA

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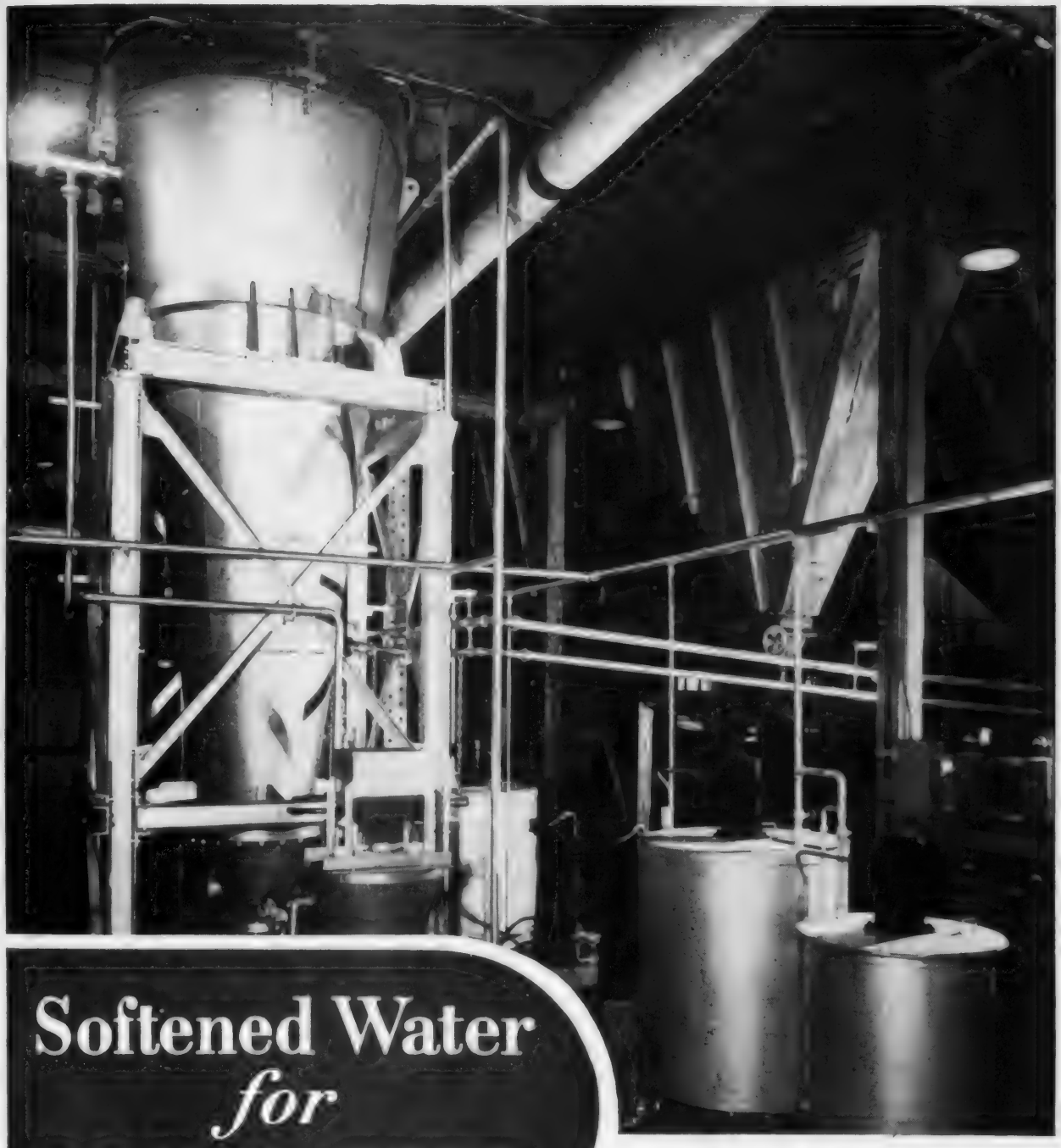

Softened Water *for* BOILER FEED by PERMUTIT

Consistent zero-hard softened water for boiler feed is supplied by "Spiractor" cold lime softener followed by a Permutit Ion Exchange softener. This is only one of a range of Permutit plant designed to supply correctly treated boiler feed. If you require further information on Permutit boiler feed water treatment plant, please write to :—

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Telephone : CHIswick 6431

For sure protection of canned foodstuffs

IT'S THE Lacquer THAT COUNTS

Yet another addition to the Coates range of Preservex lacquers. The Lacquer to guard against blown cans, can corrosion, and sulphur staining—in fact, to be recommended for all types of canning.

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And a top quality product needs top quality ingredients.
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For that irresistible *fresh* flavour you must have GOLDEN GLOW.
It's not just the experts who can tell the difference. The public may not know that it's GOLDEN GLOW that makes a product so good, but they *do* know a good thing when they taste it!
GOLDEN GLOW has more virtues than first-class flavour—
it's economical. It's so much easier to store. And it's so simple to handle.
If you want to know more about GOLDEN GLOW, 'phone us for a sample today.

Golden Glow English made Dairy Products

Spray and Roller Process; Full Cream and Separated Milk Powder; Evaporated Milk and Cream; all packed in containers to suit your requirements.

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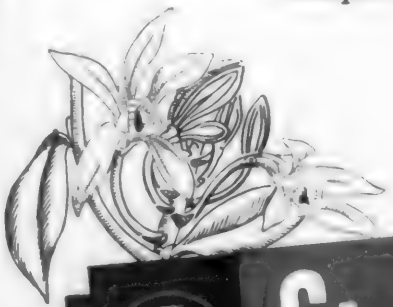
NATURAL VANILLA Bean Extracts

StaffordAllenS Vanilla Extracts are pure extractives of the finest beans. For the true flavour of natural vanilla they are unsurpassed.

Samples will gladly be sent on request.



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'Phone: CLErkenwell 1000 (7 lines)

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TAS'AL 589

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And like other leading food manufacturers Telfer's find that sparkling Clarifoil is the ideal film for windows that stay fresh and transparent, lie flat without wrinkling . . . and never stop selling! When you package in window cartons, make sure you specify Clarifoil.

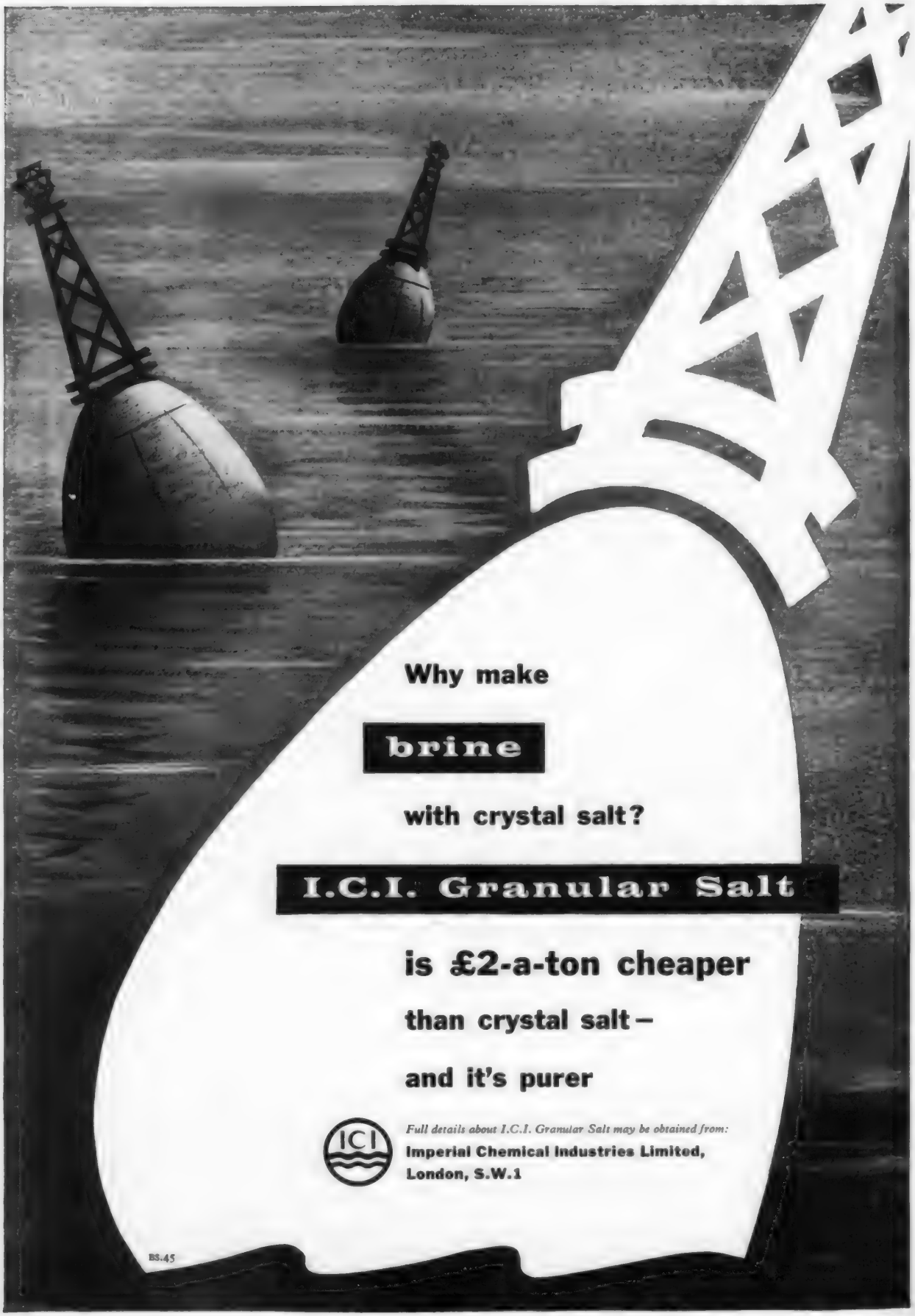
Plastics Division • British Celanese Limited

Clarifoil

TRADE MARK

TRANSPARENT ACETATE FILM

sells on sight!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I.C.I. Granular Salt
is £2-a-ton cheaper
than crystal salt –
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Full details about I.C.I. Granular Salt may be obtained from:
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PNEUTECHNIQUE

gives you push-button programme control and recording for four types of programme

Here is control which can be applied to processes where temperature variations must be accurately timed and held. Here is simple push-button control, and visual indication of the current stage of the process.

Standardised pneumatic components are arranged in circuit to form an automatic pro-

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FOUR TYPES OF PROGRAMME, each obtainable by means of four controls :

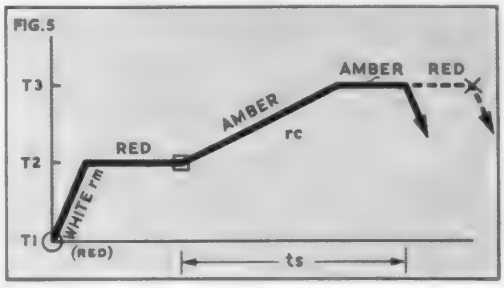
Minimum Process Temperature Setting . . .

Required Rate of Temperature Rise Setting . . .

Maximum Process Temperature Setting . . .

Total Process Time Setting.

These controls are infinitely variable within the limit of operation. Programme selection and initiation is by push-button operation. Progress is indicated through all stages by means of multi-coloured indicator lamps.



GRAPH shows five temperature changes with corresponding light indicators: (1) Maximum rate of rise to minimum process temperature, when (2) process may be held until (3) controlled rate of rise to maximum is required. (4) Temperature is held until automatic or push-button shut down.

May we send you copies of fully illustrated descriptive booklets T 39/1 and R 36?

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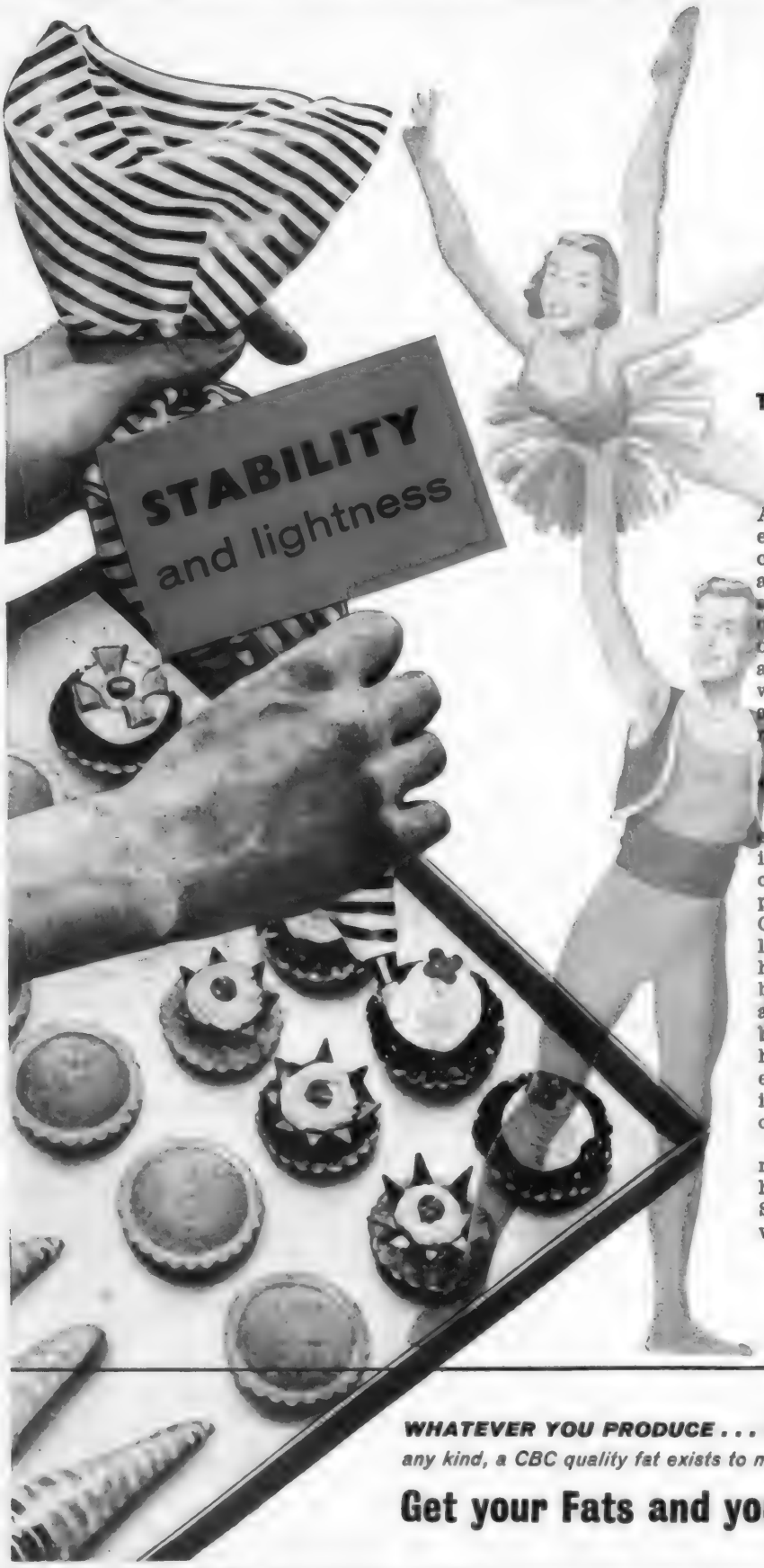

THE VITAL FACTORS IN CREAM PRODUCTION

AT THE WHIPPING STAGE, creams of every description must have the capacity to take in and hold air. This ability depends directly upon the fat, and the efficiency of the fat depends on expert refining and blending of oils. Fats for cream making must also be capable of smooth emulsifying with the other ingredients to produce a cream that has good stability with no seepage.

Choice of CBC Fats

All CBC cream-making fats bring smoothness and precision to "finishing"; lightness and good volume to cream fillings; and have a stable piping consistency. Splendo, a special CBC unsalted margarine, is particularly suitable for filling-creams; it holds air without breaking down, blends smoothly with fondant and, in addition, has an excellent colour and background flavour. Covo, an all-hydrogenated white shortening, is equally smooth and stable; and, since it is pure white and bland, it takes colour and flavouring perfectly.

If you want further information regarding our full range of fats you have only to get in touch with our Sales Director. Phone CITy 6783 or write to him at the address below.

WHATEVER YOU PRODUCE . . . *Creams, biscuits, pastry, or cakes of any kind, a CBC quality fat exists to meet your needs.*

Get your Fats and your Facts from CBC

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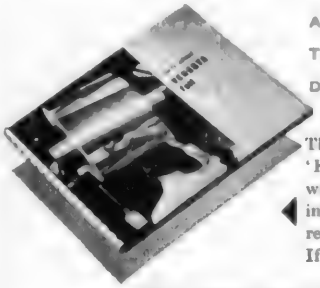
Venesta foil maintains its top position as a packaging material because:–

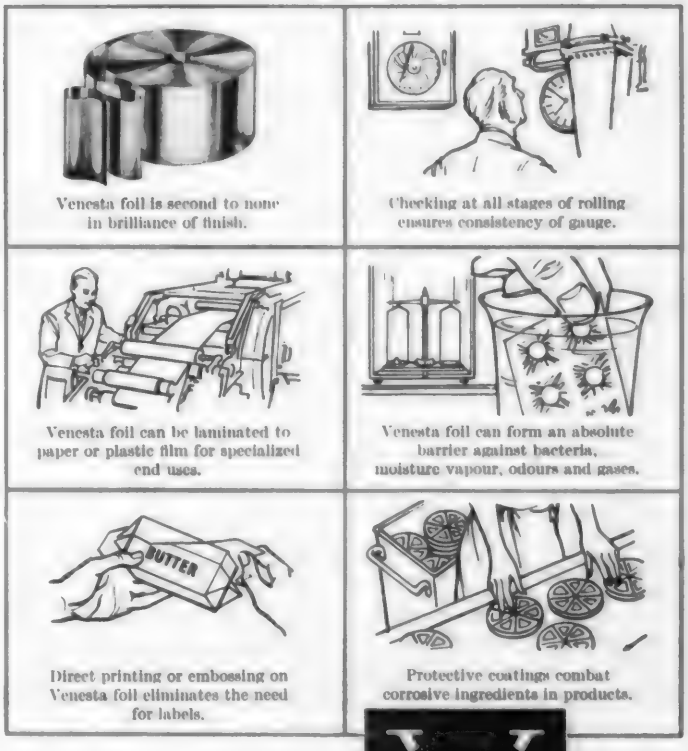
Technical skill combined with strict supervision and laboratory testing ensure that Venesta foil is consistently good.
This gives high speed packaging machines every chance to run smoothly and helps converters to laminate satisfactorily and speedily.



A PRODUCT OF THE PACKAGING DIVISION

There is a booklet called 'Facts about VENESTA Foil' which would be of interest to you. Have you received your free copy? If not please write today.

Foil wrap for freshness


Venesta foil is second to none in brilliance of finish.
Checking at all stages of rolling ensures consistency of gauge.
Venesta foil can be laminated to paper or plastic film for specialized end uses.
Venesta foil can form an absolute barrier against bacteria, moisture vapour, odours and gases.
BUTTER
Direct printing or embossing on Venesta foil eliminates the need for labels.
Protective coatings combat corrosive ingredients in products.

VENESTA LIMITED *Packaging Division*

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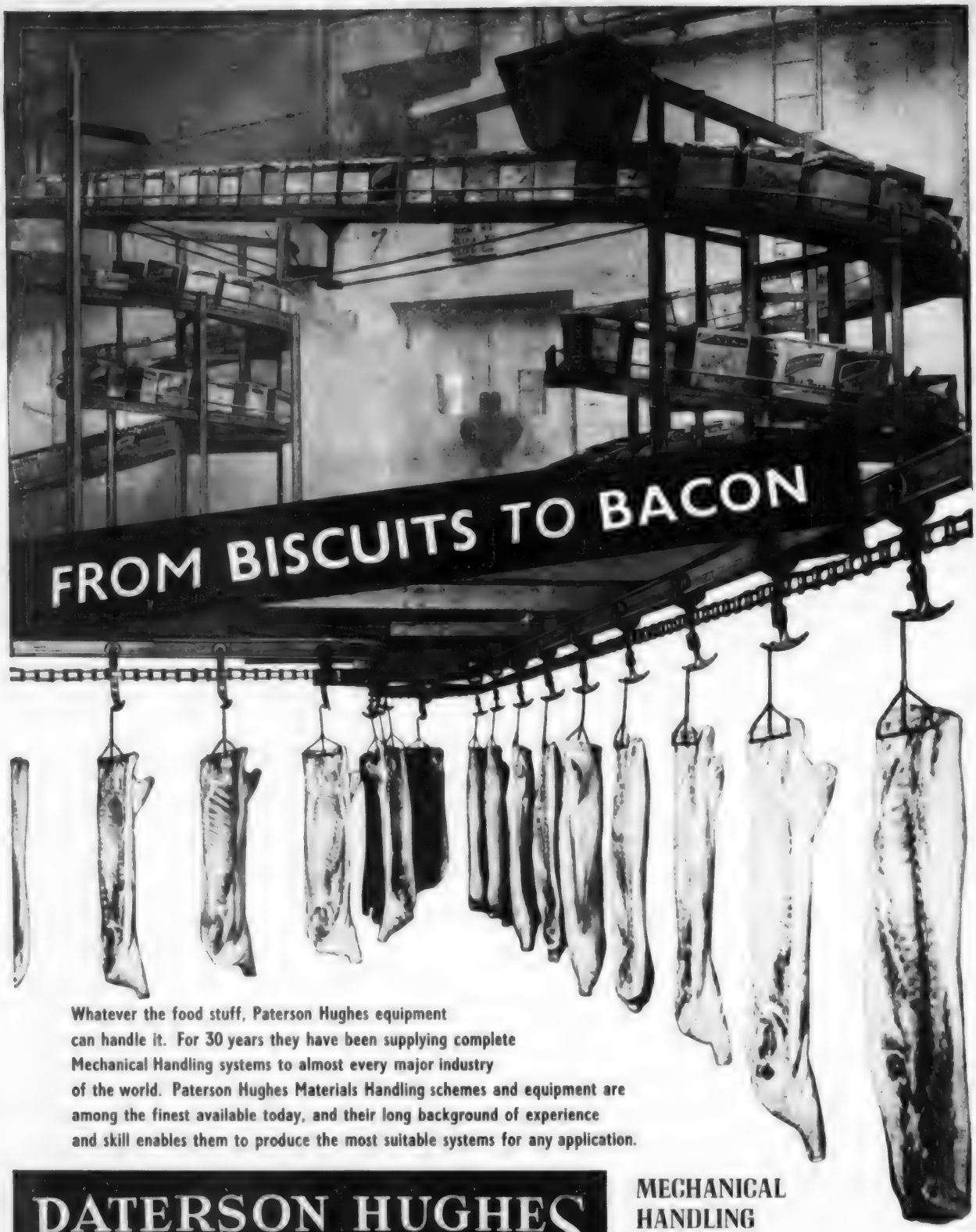

Whatever the food stuff, Paterson Hughes equipment can handle it. For 30 years they have been supplying complete Mechanical Handling systems to almost every major industry of the world. Paterson Hughes Materials Handling schemes and equipment are among the finest available today, and their long background of experience and skill enables them to produce the most suitable systems for any application.

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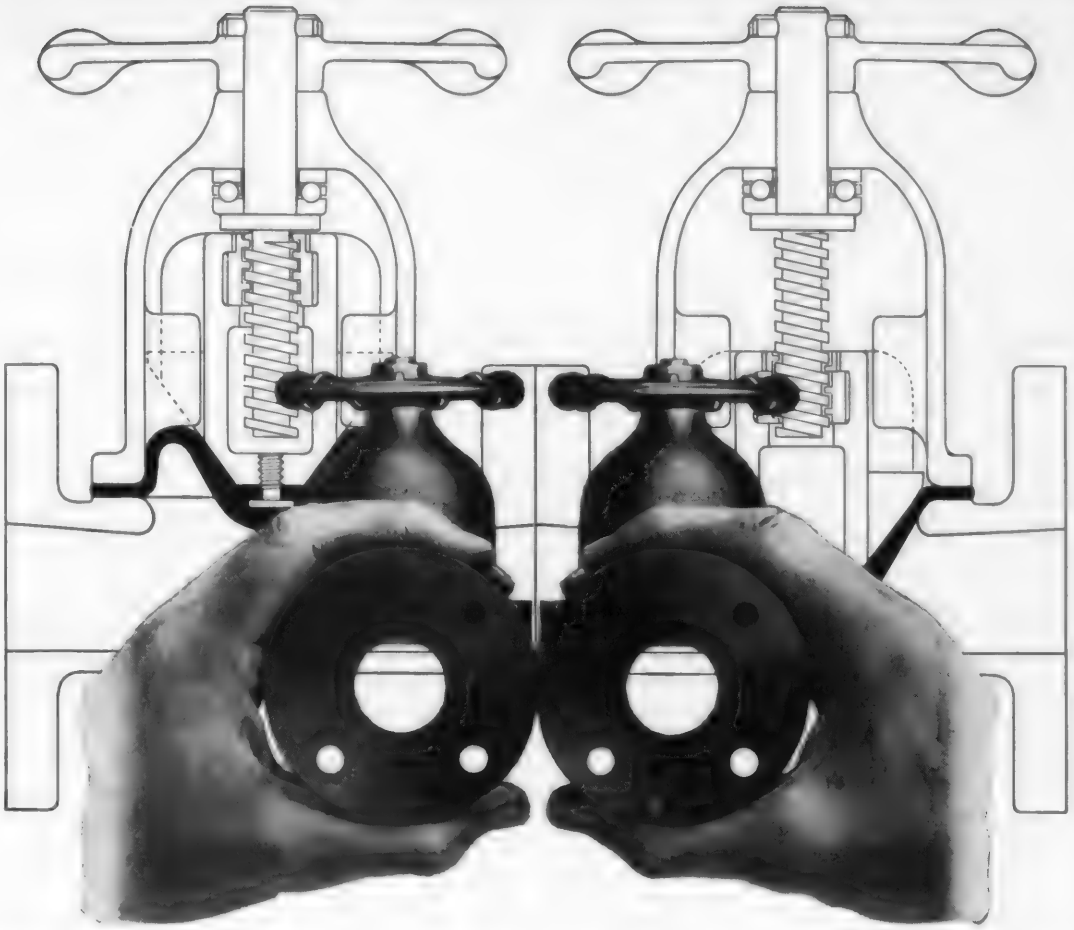

Binocular Demonstration

With the clear, pocketless bore of the Saunders Diaphragm Valve* it is obvious that excellent fluid flow is permitted — and that, should any 'gumming-up' occur, the flow can be readily restored.

The advantage of such a straight bore for lining with rubber, glass or lead (for corrosion or abrasion resistance) is also evident.

This 'immunising' of the body is in keeping with the general design which, as can be seen, preserves all mechanism behind that isolating diaphragm.

SAUNDERS DIAPHRAGM VALVES

**Details of this straight Bore, Type 'K' Valve, with Tables of Sizes and Working Pressures appear in the Saunders Technical Handbook.*

SAUNDERS VALVE COMPANY LIMITED

DIAPHRAGM VALVE DIVISION

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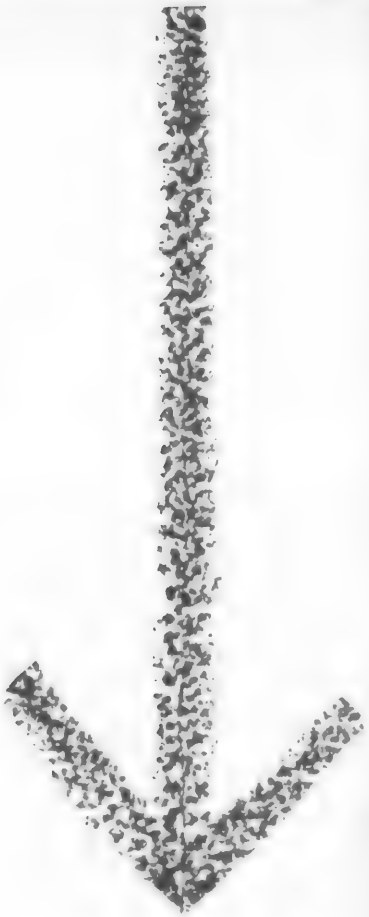
Prevent accidents by design...



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Tri-pedal striated for heavy loading and wet conditions.

Tri-pedal plain for absolute cleanliness and heavy loads.

If you're in baking or paper making — or any other business where there's heavy work afoot — you should fit a Tri-pedal floor. Tri-pedal tiles are made of iron. Each unit has a scientifically designed tread eliminating accident-causing slips of the foot. The striations also act as drainage channels — very useful aids where floors need frequent swabbing to maintain full cleanliness. The plain surface tiles are extremely easy to clean and keep free from moisture — you will know which tile type is best suited for certain sections of your factory.

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BUTTERLEY Tri-pedal Iron Paving System

FOUNDED 1792

Butterley Ironworks, Near Derby. Telephone: Ripley 411 (9 lines). London Office: 9 Upper Belgrave St., S.W.1. Telephone: Sloane 8172/3

Makers since 1790 of railway and other bridges, constructional steelwork, unit bridging, overhead cranes, railway wagons and mine cars, Meehanite castings, iron paving, mining and sheet metal machinery, wrought iron bars, sewage ejectors and pumps, wool washing machinery, Oxygenerators, tonnage oxygen/nitrogen plants, high quality bricks, Aglite lightweight aggregate.

BUT 8504

Instant hot water kept constant . . .

Too much fuel is often used for too little hot water. With steam and cold water available, the only equipment you need is a Leonard *thermostatic* steam and water mixer, and you make all the hot water your steam can provide as and when you want it. You will save heat storage losses. You will save the high costs of heat exchange equipment. You will save space and installation costs. You will get warm water or hot water at will, kept at a uniform temperature by a thermostat within the mixer.

Leonard *thermostatic* mixing valves are widely used by food manufacturers, dairies and canteens throughout the world.

For full information write for leaflet No. ZH/0

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Out of this comes salt by the fastest, cleanest, cheapest method

Seven tons of Pure Dried Vacuum salt can be pumped through this pipe within thirty minutes—straight into your saturator or silo ! I.C.I.'s new air-discharge vehicles cut out all shovelling of loose salt, and man-handling of bagged salt. It's the modern hygienic way to buy salt in bulk—a big saver of time and cost.

Send now for our free booklet 'Streamlined'—it will give you full details of this new time-and-money-saving service.

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NEW

SENSATIONAL MODEL NEEDS NO OPERATOR!

PONY LABELRITE

MODEL A.86.ML

FULLY AUTOMATIC

60 OR 120 LABELS A MINUTE

Ask us for diagrammatic explanatory folder.

12 IMPORTANT POINTS TO NOTE:

1. Vacuum label pick up. 2. Bottles labelled in the vertical position. 3. All-over gluing of the label, or stencil gluing if required. 4. Variable speed: 30–60 a minute with large bottles, 60–120 a minute with small bottles, two at a time. 5. Your existing conveyor can be passed through the machine if required to avoid dead plates and plough-offs. 6. Self-cleaning. 7. No glue seepage. 8. Precision label placement. 9. Simple change-over of bottle/label sizes. 10. Label platen area: Single bottle labelling 6" x 4½" at 60 a minute; twin bottle labelling 6" x 4½" at 120 a minute. 11. If no bottle, no label is fed. 12. Micro glue control.

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FOR VISCOUS FILLING THE NEW... KELLIE

14 HEAD PISTON FILLING MACHINE

TYPE 15 FP

This Rotary Piston Filler will fill up to 300 containers per minute, depending on the product, the container size and shape. This machine will fill all products which in general can be handled by a gear or piston pump such as fruit pulps, baby foods, soup, fruit concentrates and so on.
Electro-pneumatic no-can-no-fill device is incorporated.
Type 15 FP. will handle all size containers from 3 fluid ounces to 32 fluid ounces and the diameter range is from 211 to 401.
The machine is adaptable for any height of container from 1" to $4\frac{3}{4}$".
Write today for full particulars.

KELLIE for FOOD PLANT

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MEASUREMENT

Batch control for a liquid mix nowadays requires precise amounts of several ingredients to be dispensed in exact quantities. Too often this job still depends on a man with a bucket and a mind of his own. MEASUREMENT have replaced this uncertain method with a system of metered control. The quantities are pre-set on a dialled control panel and supplied to the mix, from a remote control point if necessary, at the press of a button. Quantities are precise, records are automatic, control is complete and the bucket is out.

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The correct choice of pallet can mean a big saving in handling costs and storage space: the wrong choice can be disastrous. Would it be best made from hardwood or softwood? Should it be slatted? Reversible? Single-faced? We can help you determine the specification best suited to your needs. As one of the largest pallet manufacturers in the country, with a standard range of over 50 different types, we feel sure our experience would be valuable to *you*.

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Express Dairy Company Limited
H. J. Heinz Company Limited
H. P. Sauce Limited
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MATERIALS HANDLING DIVISION

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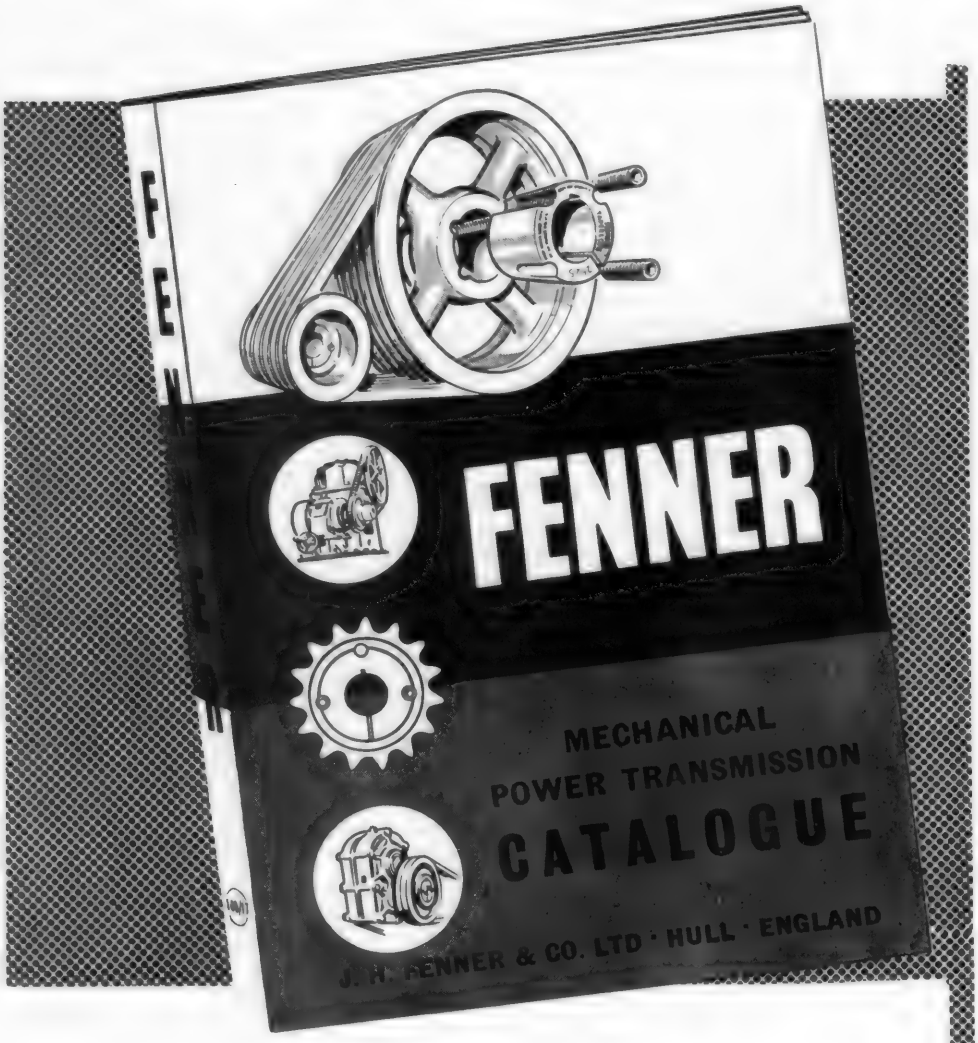

V-BELT DRIVES

V-BELTS

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Britain's first pocket size drive handbook, with copious information, convenient to handle and easy to read. Sales 'patter' has been rigorously excluded—this is a working tool for designers and draughtsmen who have already decided to buy Fenner products. It contains just the information the user requires as determined in 25 years experience by the engineering staff of

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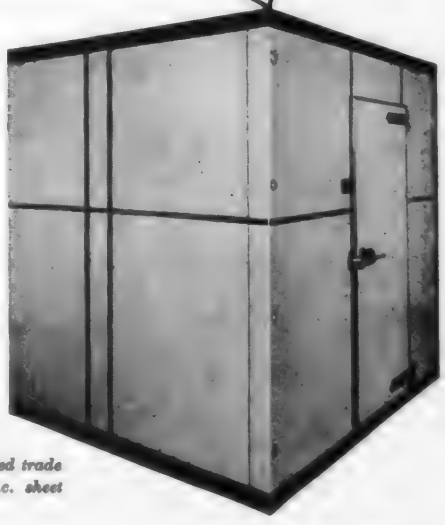
FOR HYGIENIC REFRIGERATION THE IDEAL MATERIAL IS 'DARVIC' P.V.C.

'DARVIC' P.V.C. SHEET, manufactured by I.C.I., is the perfect plastic material for food trays and containers, refrigerator linings and cabinets, and any surface on which food is prepared. 'Darvic' is odourless and does not taint food and drink. It is also tough and long-lasting, with considerable rigidity even in thin sheets.



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OF FOG DUST AND BACTERIA

AUTOMATICALLY CONTROLLED
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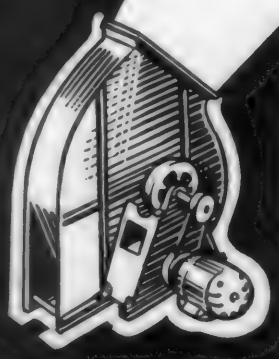

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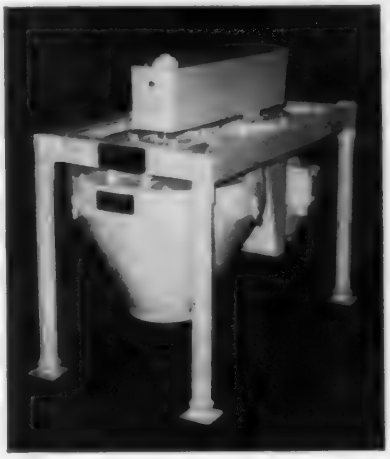

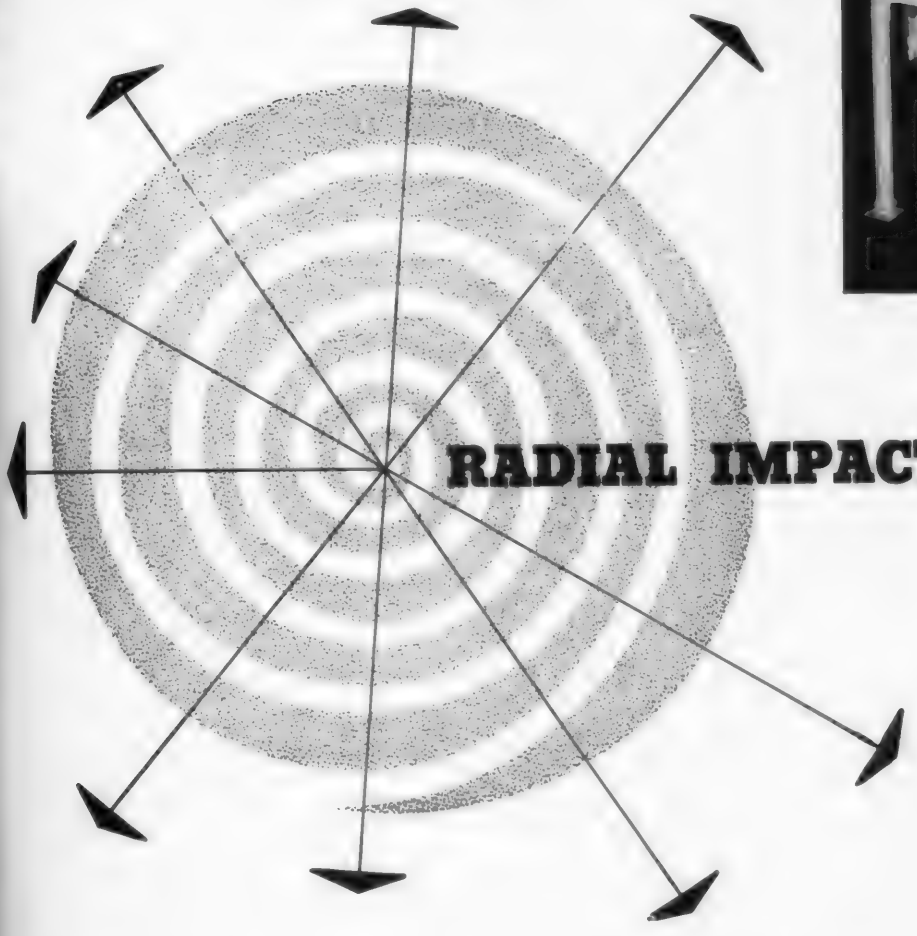

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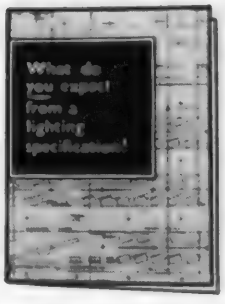

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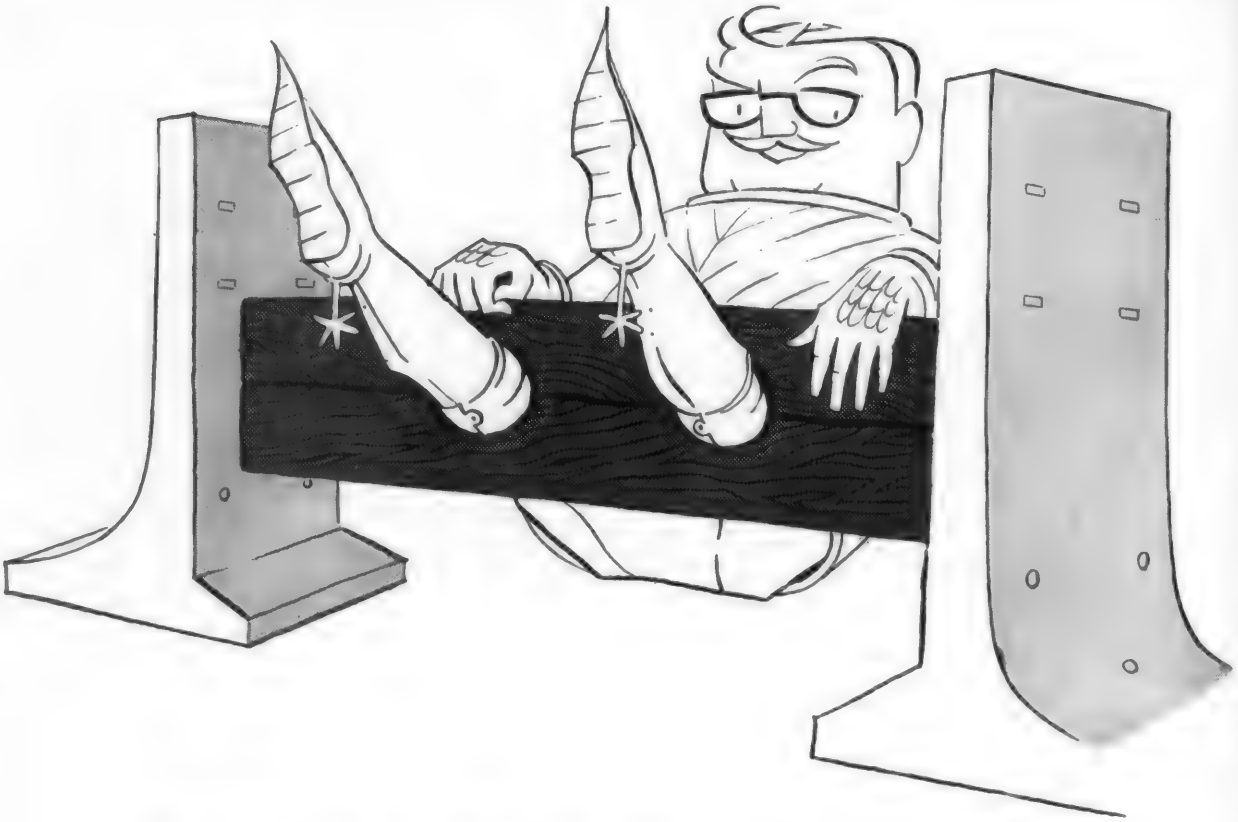

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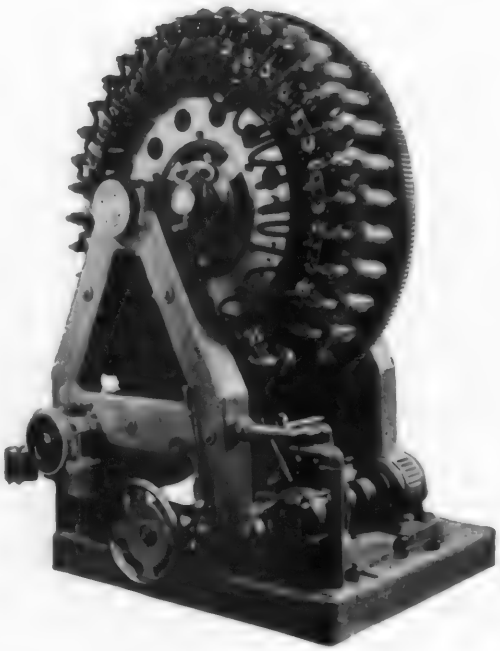

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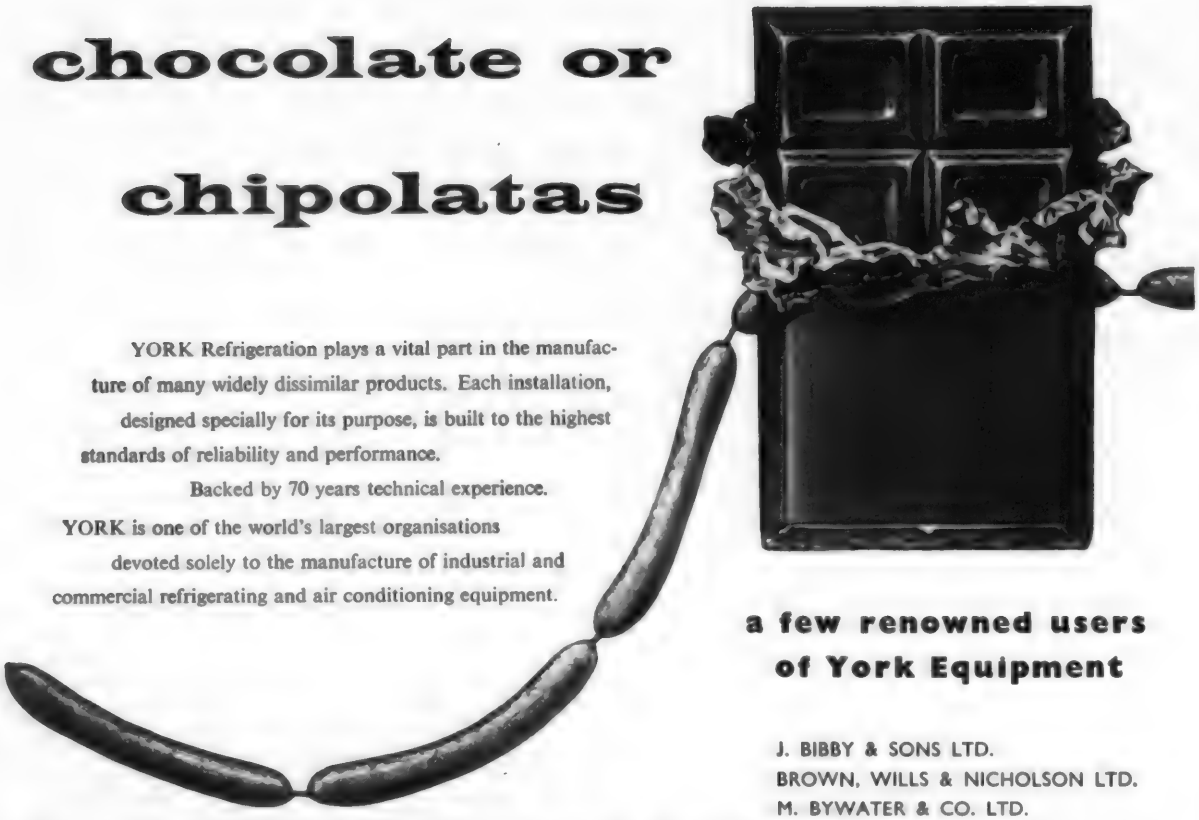

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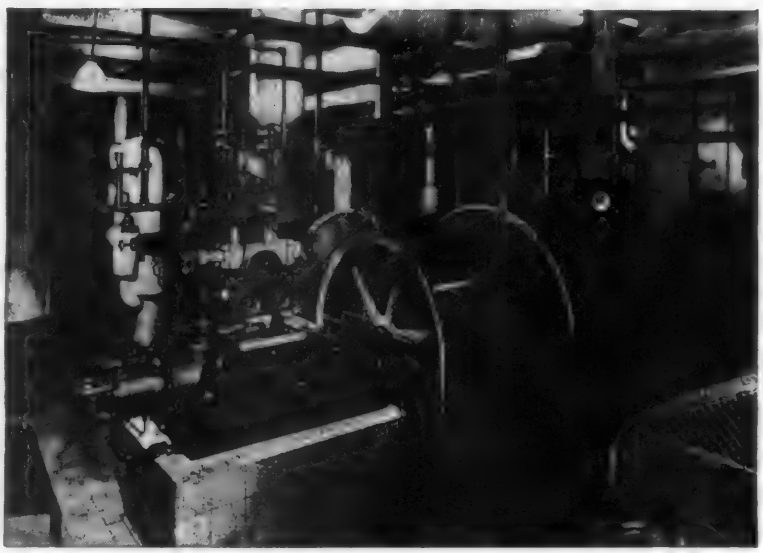

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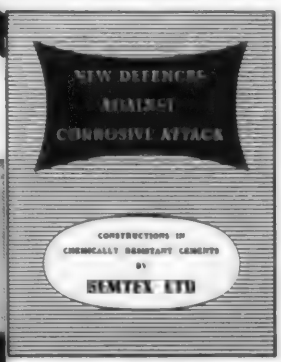

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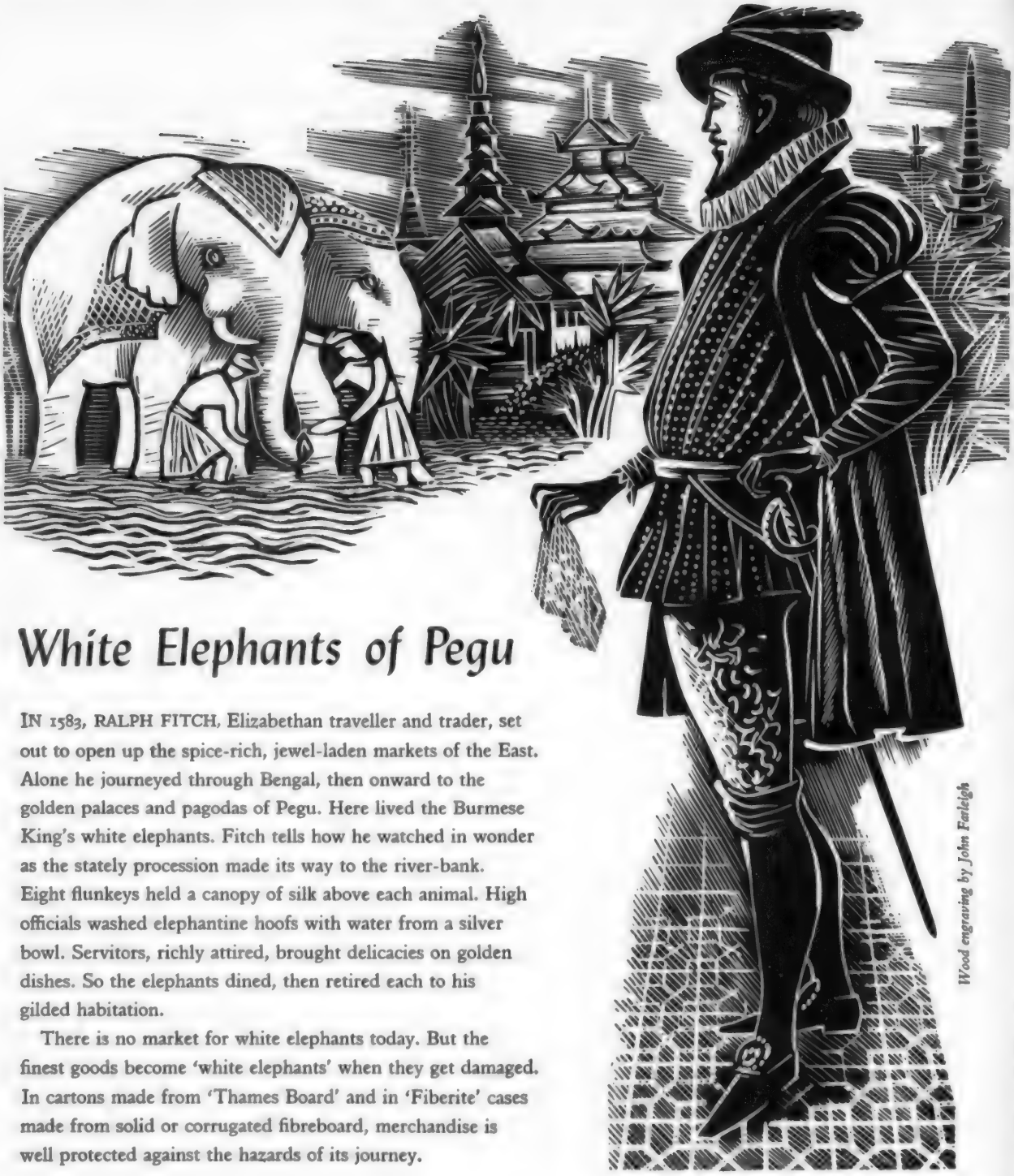

Wood engraving by John Farleigh

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FOOD MANUFACTURE

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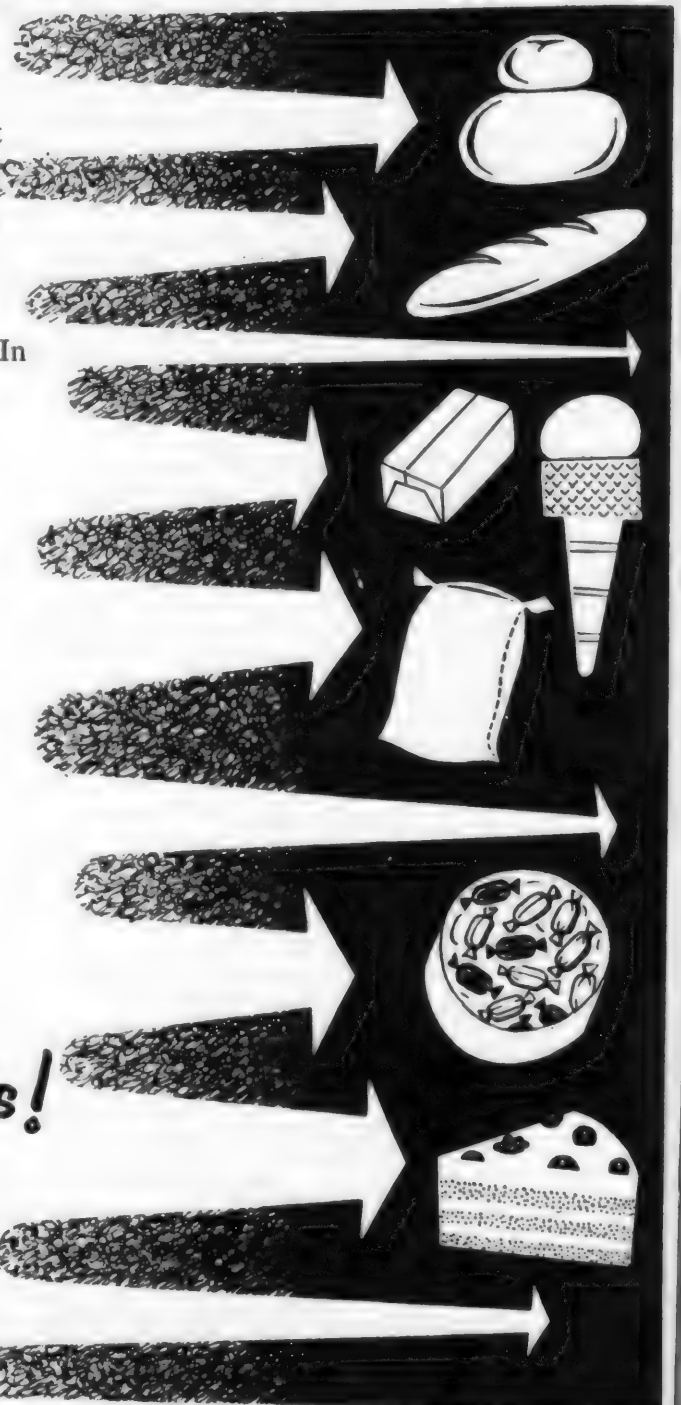

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. . . FOR FOOD MANUFACTURE

FOOD MANUFACTURE

Vol. XXXII, No. 11 November 1, 1957

Radioactive milk

In the September issue of Food Manufacture we commented, under the heading of *Milk, strontium and cancer,* on the dangers associated with the accumulation of radioactive substances in milk. We little realised at that time that we were to have such a quick and dramatic demonstration of this hazard. The recent accident at the Windscale plutonium factory has emphasised only too clearly the dangers from contaminated foodstuffs that are a corollary to our atomic age. Moreover, in this case the danger has come from a production unit, rather than from the detonation of an end product. Fortunately, the element involved on this occasion is radioactive iodine, which has a much shorter half-life, and therefore disappears much more rapidly, than its more dangerous strontium counterpart. None the less its distribution over the countryside is a cause for grave concern.

On the other hand, it is as well that the true implications of the accident are clearly and widely understood. The plant at Windscale is not a power station, as is the near-by station at Calder Hall, and the geographical proximity of the two places must not blind us to the very great differences in their design and function. The fear has naturally arisen that as atomic power stations are erected throughout the country, an even wider area of agricultural land will be exposed to contamination as a result of similar accidents. This is not so. The reaction elements in the Windscale plant are cooled by air, which is vented to the atmosphere, so that any increase in the level of contamination of the cooling air must inevitably be spread abroad. In power-generating reactors of the Calder Hall and later types, the elements are cooled by carbon dioxide, which circulates in a closed system and is never vented to the air. The danger of a spreading of a radioactive material in a manner similar to that which occurred at Windscale therefore just does not arise.

Bombs and power stations are as unlike, ecologically, as guns and butter. In the power-hungry age in which we live, Britain has need of every available resource, and has led the world in its efforts to harness atomic power to peaceful uses. It would be a great pity if the effects of this accident were to cause misplaced concern or to throw our efforts in this direction into disrepute.

Changes in welfare foods

Of all the vitamins known to be essential in human nutrition, vitamin D is the only one which has ever given rise to the suspicion that too much of a good thing might be harmful. Nutrition experts have for some time been afraid of the possible harmful effects of "self-medication" with highly potent vitamin D concentrates, particularly where children were concerned, and the conviction has increased that even the level of vitamin D in the officially sponsored Welfare foods might be too high. This opinion has prevailed and has now been implemented by Government action. On the basis of a report on Welfare foods by a joint sub-committee of the Central and Scottish Standing Medical Advisory Committee, the Minister of Health and the Secretary of State for Scotland have told local authorities that they have made arrangements, in co-operation with the Minister of Agriculture, Fisheries and Food, for the vitamin D content of National Dried Milk to be reduced from a minimum of 280 international units per dry oz. to an average of 100 units. The vitamin D content of Welfare cod liver oil is to be similarly reduced from 200 to 100 i.u. per gram.

Changes are also to be made in the distribution of Welfare orange juice. The Government have accepted a recommendation of the Committee that the issue of juice to children between 2 and 5 years old should be discontinued. In this case there is no question of possible harm from the vitamin C contained in the juice. The fact is simply that the diet of children over 2 years old is considered to be fully adequate with respect to vitamin C without further supplement.

Manufacturers of soft drinks, amongst which orange is the predominantly popular flavour, should feel a considerable benefit from the latter order, as the supply position for concentrated orange juice should be considerably eased.

Thirst for soft drinks

THE public's thirst for soft drinks continues to increase. In the first six months of this year, over $9\frac{3}{4}$ million gallons more were produced than in the same period last year, an increase of $6\frac{1}{2}$%. Production of concentrated squashes and cordials rose by 6%, and that of unconcentrated drinks by 7%, according to the National Association of Soft Drinks Manufacturers. The full effect of the poor weather in the later part of the summer may still be felt, however. The association points out that production in the third quarter of 1956 fell to below 83 m. gal., because of bad weather, whereas in the corresponding quarter of 1955 it rose to 109 m. gal.

Although the general trend seems to be one of increased consumption, the details of this increase seem to be as difficult to forecast as the weather on which they partially depend. Five years ago it was thought by the industry that output might rise by about 10% per year. In fact, production in 1954 was almost identical with that in 1953, but the excellent summer of 1955 brought an increase of almost one-third. Despite the poor weather of 1954, it was possible to maintain production almost at the 1955 level, and the figures so far reported for this year again show the increase mentioned above. It seems more than possible, therefore, that one warm summer increases the demand for thirst-quenching and cooling drinks, and that, once created, this demand continues in subsequent summers, regardless of the actual weather conditions. One might, indeed, go so far as to speculate that soft drinks are as habit-forming as their more robust brothers, even if the habit is itself of less serious consequence!

What employers think of graduates

SINCE industry is the largest single employer of university graduates, it is evident that if most graduates are to fit in well and prosper in their chosen occupation the universities must keep the needs of industry firmly in mind. This is not to say that a university education should be simply a vocational training—it would, indeed, lose much of its value if it were; but it is clear from a new P.E.P. report* that by no means all industrial employers are satisfied with the subsequent progress of their graduate employees, and that many graduates have difficulty in adapting themselves to the industrial climate. It would appear, therefore, that there is a real need for closer liaison between industry and the universities on this vital problem.

That employers expect much more of the universities than the provision of a specialised vocational training is made quite plain. A survey of the qualities on which graduate recruits were assessed showed that many employers were distinctly unimpressed by high academic qualifications. They looked instead for personal qualities such as the ability to co-operate with and eventually to control other staff. Only when employing science graduates—and often then only when research posts were to be filled—did most employers look for high technical qualifications.

On the other side of the picture, it seems that the increased intake of graduates into industry is having a markedly beneficial effect. The report shows that in general the graduate strength of firms increases more than proportionately with their size, and draws the important conclusion that the progress of an undertaking (of which size is one criterion) is directly related to its use of qualified men. In fact, it is not so much a question of being large enough to employ qualified men as of being well enough qualified to grow.

* *Graduates in Industry*. Political and Economic Planning. 1957. Allen and Unwin, London. Pp. xxii+261. 30s. net.

Canned beer—implications for the food industry

BREWERS think that the production of canned beer in 1957 will be at least double the 1956 level. With many more brewers adopting these containers, production for the current year is likely to reach 80 million cans. This still represents only a very small fraction of total beer sales, however. Of the 24·5 m. bulk barrels brewed in this country in an average year, some 40% is sold in ready-packed form. Of this 40%, this year's figure for canned beer will represent only about 2%.

These figures make an interesting comparison with those available for the U.S.A. In that country, 80% of all beer is sold in prepacked form. Over half is in cans, last year's output reaching 8,000 m. —just 100 times this year's estimated production in this country.

We can never compete with the U.S.A. in terms of population, but if a similar 40% of our beer production were to be marketed in cans, the annual sale of canned beer in this country would fall little short of 4,000 m., or half the American figure. Even if the Englishman keeps his overall preference for draught beer, the proportion of "packaged" beer sold in cans might well reach the American figure of "over half," and this alone would entail an annual output of some 2,000 m. cans, or 25 times the present amount.

These figures have serious implications for the tinplate industry, as well as for the can makers and for all users of tinplate. As well as affecting the total demand for tinplate, the increased sale of beer in cans may have other significant effects. For example, food products are predominantly packed in "shiny" cans, which are subsequently labelled. Beer cans

are largely lithographed, however, and their widespread use may stimulate the increased use of this process in the food trade.

At the present moment 14 breweries have entered the canned-beer trade, and 32 types of beer are being marketed in this way. Some breweries are canning existing types of beer, but others have developed new types especially for this purpose. The sale of lager-type beer in cans is likely to rise particularly quickly, as this type of beer chills well, and cans are well suited for stacking in refrigerators and give a rapid rate of cooling.

A range of beers currently being canned in Britain is illustrated on this month's packaging page.

Thaw indicator for frozen foods

ONE difficulty of marketing frozen foods is that no clear indication can be gained from a cursory investigation of the food in its frozen state of its history since the time of its manufacture. Too often the food is allowed to thaw partially at some time during its storage life, with a resultant rapid growth of spoilage organisms, and is then frozen again, so that the deterioration in its condition is not noticed until it reaches the customer's kitchen. The need for a practical "thaw indicator" has been recognised throughout the frozen food industry for many years. Such an indicator would show when and if a frozen product had exceeded a specific critical maximum temperature for a period of time deleterious to the product. An American firm, Aseptic-Thermo Indicator Co., of California, have now developed such an indicator to the stage of controlled field tests, and criticisms from the industry are being invited.

Known as the *Freez-Chex*, the indicator consists of a small tube containing a combination of materials which, when a predetermined temperature is exceeded, will give a sharply contrasting colour change from yellow to red. The tube is contained in a polythene bag, and the overall measurements are 2 in. × ¾ in. × ½ in. It can be shipped and stored under normal temperature conditions without special handling, as it is automatically activated on freezing. The length of time required for this activation depends on the temperature of freezing, being 1 hr. at −50°F. and 6 hr. at 0°F. The formulation of the chemicals on which the indicator is based is varied with the critical maximum temperature which it is desired to detect, so that a range of indicators is available to suit the requirements of users.

The indicators are designed for incorporation in cartons of food on the packaging line, so that they are frozen along with the food. It is suggested by the manufacturers that in order to give maximum protection the indicator should be packed at or near the outside of the carton.

A curse on corrosion

NEVER before—certainly not in modern times—have so many distinguished people met together in such elegant surroundings to utter a collective curse. The occasion was the Corrosion Convention Dinner at the Waldorf Hotel, London, on October 15. Some three hundred scientists, technologists and industrialists gathered there to listen to Sir Hugh Beaver, K.B.E., President of the Federation of British Industries, propose the toast "The Fight Against Corrosion."

Sir Hugh, who is managing director of Arthur Guiness, Son and Co., said that the toast as written on the programme was mere camouflage. "What we are really met to do," said he, "is to pronounce a curse on corrosion." Corrosion was ever-present, forever attacking and destroying the possessions of man. The cost was literally of the order of some thousands of millions of pounds annually. The Corrosion Convention and its allied Exhibition was a long overdue step in the direction of a national campaign against corrosion.

The proceedings at the Waldorf Hotel, the climax of the Convention, were opened by Mr. W. Leonard Hill, chairman of the Leonard Hill Technical Group, organisers of the Convention and Exhibition. He was followed by Mr. Harmar Nicholls, M.P., Parliamentary Secretary to the Ministry of Works, who spoke entertainingly and informatively on the national significance of corrosion and its prevention. The toast to the guests was proposed by Mr. W. G. Norris, managing director of Leonard Hill, Limited, and the reply was made by Mr. P. G. H. Fender, the famous England cricketer, and chairman of Herbert Fender and Co., wine merchants. Among the guests were Professor H. D. Kay, director of the National Institute for Research in Dairying, and Dr. E. H. T. Hoblyn, M.B.E., director of the Food Machinery Association.

Both the Exhibition and the Convention were remarkably successful. Nearly 600 delegates, many from foreign countries, including the Soviet Union, packed into the Central Hall, Westminster, to hear and discuss a programme of thirteen papers on various aspects of corrosion technology. In charge of proceedings there was Mr. R. G. Paterson, editor of *Corrosion Technology*.

At the Exhibition over 50 firms showed the latest developments in corrosion technology, ranging from paint and plastics to cathodic protection. It was the most comprehensive and the best organised display of its kind ever to be staged in this country and many visitors expressed the wish for it to be held periodically. At present there is every likelihood of the next exhibition being staged in 1959.

The Exhibition and Convention have contributed something of permanent value to the cause of cor-

rosion technology and the organisers deserve congratulations on their enterprise. Industry has been roused to action against corrosion and is anxious to have practical advice on ways of combatting it. A subscription to *Corrosion Technology* is the answer. Write to 9, Eden Street, London, N.W.1, for a copy.

Current thinking on quality control

In the production of all classes of industrial commodity, the increasingly competitive nature of the market is demanding the exercise of a stringent degree of quality control. This is particularly so in the food industry, where failure to control quality can result not only in loss of good name but in extremely costly losses of stocks. Fortunately, the day is now past when a few of our more progressive manufacturers were alone in realising the immense value of systematic quality control. More and more food manufacturers are introducing quality control departments, and are appointing technically qualified staff to direct their activities.

At this point it is quite natural that the question should be asked: "Are we, in fact, making the most of the technical skill which is being put into quality control, and of the mass of data which is being obtained?" Many and varied answers were given to this question at a recent symposium on the quality control of food, sponsored jointly by the Society of Chemical Industry and the Association of Public Analysts. Details of quality control procedures were given by speakers from many branches of the food industry, and particular attention was paid to the statistical examination of results. Many examples were given to show how the statistical analysis of results obtained in the factory could provide valuable additional information. It is possible to calculate, for example, from a series of check weights on cans, the exact safety margin necessary to avoid contravention of a net-weight declaration. This allows a manufacturer to avoid waste by over-filling whilst at the same time protecting him from the dangers of under-filling.

Several speakers pointed out the dangers of badly designed sampling techniques, which might lead to the performance of a great deal of work to obtain results which in the end were of doubtful significance. This in turn could lead to the twin errors of rejecting satisfactory batches and accepting unsatisfactory ones. The value of a sound knowledge of the more elementary principles of statistics was shown to be of great benefit in the design of sampling and analytical programmes, and one was left with the feeling that the wider application of these principles would undoubtedly lead to a much more efficient and economical use of quality control staff than is usual in food factories today.

Barley for beer

The brewing industry before the war took about half of all the barley produced in the U.K., now it takes less than 20%. This must not be taken to indicate that there has been a pronounced change in the drinking habits of the British and that there has been a decline in the domestic consumption of beer—far from it! The fact is the production of barley has increased by over three times since 1939. This increase has been brought about partly by an increase in acreage and partly by increased productivity per acre. There has also been a 10% reduction in malting loss during processing.

According to Dr. A. H. Cook, F.R.S., Assistant Director of Research to the Brewing Industry Research Foundation, there has been a two-fold increase in acreage and an overall increase in yield from 16 cwt. (32 bushels) per acre in 1938 to between 22 and 23 cwt. per acre in 1956. This he attributes to agricultural mechanisation and to the work of the plant breeder, the botanist and the chemist.

Perhaps the greatest contribution has been made by the plant breeder in the evolution of improved strains of barley, of which "Proctor," the best known, represents a distinct trend away from the dual-purpose barleys, *i.e.* feed and malting. The tendency then is for greater specialisation, because high yield counts for nothing to the brewing industry if a new strain of barley has a poor malting quality.

Obviously a multiplicity of varieties, planted according to the whims and fancies of the individual farmer, as was the case in the past, is not in the best interests of British agriculture, because the individual has neither the facilities, nor the money, nor the time to carry out thorough trials of all the known varieties under a wide variety of conditions over a long period of years and followed by a thorough statistical examination of the results.

Farmers' Leaflet No. 2 of 1957, issued by the National Institute of Agricultural Botany provides the up-to-the-minute answer. The list is revised annually and additions and removals are made after trials have shewn the superiority of new varieties. The purpose is to help farmers to choose the best type of barley to sow, according to various factors, rated on a points system—probable yield, standing power, shortness of straw, resistance to loose smut, resistance to mildew, earliness of ripening and the malting quality of the resulting grain.

This leaflet summarises in practical form the combined work of three research bodies—the Plant Breeding Institute, the National Institute of Agricultural Botany and the Brewing Industry Research Foundation, together with the results of processing trials carried out by brewers and maltsters.

All-in-One Foods for All Ages

"FOOD MANUFACTURE" Visits the Glaxo Laboratories

In the earliest weeks of life, and often again in moments of illness and weakness, human beings are dependent on a single source of nutrients. Great progress has been made in the development of comprehensive foods for babies and adults, and we present below a description of the production methods of Glaxo Laboratories, Ltd., a firm prominent in this specialised field.

WHEN Joseph Nathan, a New Zealand trader, first formed a company in the second half of the nineteenth century, he can have had no conception that the firm he was founding was destined to grow to international stature in the field of pharmaceuticals and speciality foods. Yet from small beginnings then the firm of Glaxo Laboratories, Ltd., has grown. With its list of products now nearing the 100 mark, Glaxo today may seem far removed from the original Glaxo Milk Food which "builds bonnie babies." But infant foods remain an important part of the company's business. The name Glaxo has now taken on a wider connotation, and the name *Ostermilk* has been given to the roller-dried, milk-powder baby food, though this is still marketed as Glaxo in many parts of the world. A cereal baby food, *Farex*, is now manufactured, and the company's continued interest in food products is seen in their products *GlucoDin*, *Casilan*, *Colact* and *Complan*. The last named is of particular interest, in that the firm claim it to be the first completely comprehensive food ever developed in solid form.

Milk foods for babies

The basis of Glaxo's *Ostermilk* baby food is roller-dried full-cream milk. In all baby foods, digestibility is of prime importance. The hot-roller drying process has been found to have a markedly beneficial effect on the curd properties of the reconstituted milk, which forms a curd distinctly softer than that of untreated cow's milk and more like that of human milk.

Above: **Milk powder is carefully examined and is then blended to give a uniform product.**

Another factor important in the preparation of baby foods is the fact that cow's milk differs considerably in composition from the human milk for which it is intended as a substitute. The protein content is higher, and the carbohydrate content is somewhat lower. This difference is of considerable importance when very young babies are to be fed, and

Blending the milk powder in the production of Ostermilk. The mixed powder is transported to the hoppers of the sifting machines seen in the background.

Glaxo therefore prepare a special grade of *Ostermilk* designed for feeding babies up to the age of two to three months. The fat and protein portions of this milk are reduced, without detriment to its calorific value, by the addition to the full-cream powder of lactose, the natural milk sugar.

In addition to these modifications, both grades of Ostermilk are fortified with iron, in which cow's milk is notoriously deficient. This is added before drying in the form of ferrous ammonium citrate, to give an iron content of 1·1 mg. per oz. (40 p.p.m.). Vitamin D, in the form of calciferol, is also added to the milk before it is dried (100 i.u. per oz.).

Compounding the foods

The roller-dried full-cream milk powder is received at the Greenford factory, where Glaxo's baby foods are compounded, from the company's drying plants. Much of the milk comes from New Zealand, where Glaxo own drying plants at Bunnythorpe and Wellington, but some comes from Driffield, Yorkshire, where a modern drying plant is operated.

On receipt in the manufacturing section, the milk powder is carefully examined for any defect. A keen sense of smell is still one of the most useful assets in the detection of faults in milk powder, and operatives are specially trained to detect any sign of off-odour. At the same time analytical control of the powder is maintained throughout the various stages of production. When the powder has been passed as satisfactory, it is put into large horizontally revolving drums, and well mixed. In the preparation of Ostermilk No. 1, which contains added lactose, the lactose is added as a dry powder at this stage.

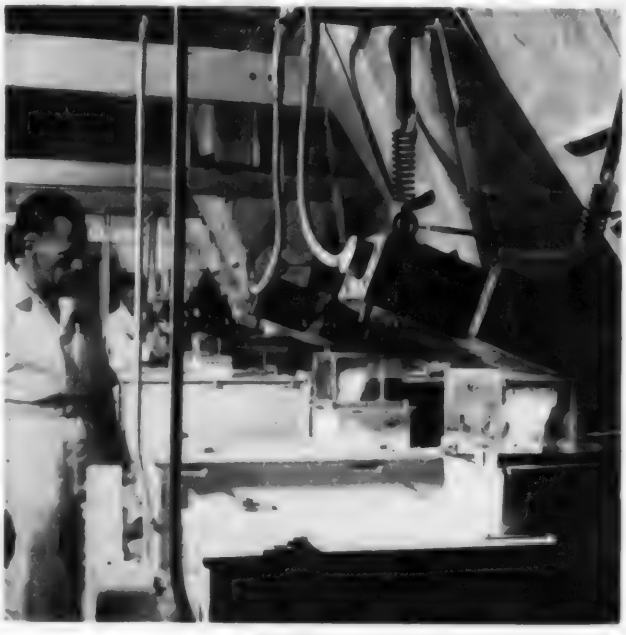
The mixed powder is filled from the mixing drum into steel bins, from which it goes into large hoppers, which feed a series of brush sieves. These ensure that the powder is in a light and finely divided form before packaging, and guard against the accidental incorporation of foreign matter.

In the packing department the Ostermilk is automatically weighed into bags which are then closed and inserted in the familiar round tins. For Welfare Centres, an alternative form of packaging has now been introduced. In this the weighed Ostermilk is filled into polythene bags automatically. The bags, after heat sealing, are packed in cardboard cartons which are overwrapped with M.S.T. cellulose film. The polythene protects the powder from contamination with moisture, whilst the cellulose protects against odour pick-up.

To meet the demands of some overseas markets sweetened milk foods are required. As well as the two types of Ostermilk described above, Glaxo, therefore, prepare two foods containing 10% cane sugar: one having a 20% butterfat content and the other 10%.

Cereal food

Farex, the cereal baby food made by Glaxo since 1934, is a



Vibratory feed equipment. A battery of these machines feeds the milk powder from the blenders into the sifters. The operator is able to adjust the flow of the powder (which is screened from the atmosphere by transparent covers) according to the requirements of the packing section.

A general view of the extensive blending floor. The operatives are filling the feed hoppers to sifting machines.

ready-cooked blend of three cereals, fortified with iron, calcium, vitamin D, vitamins B_1 and B_2, and yeast. The flours are weighed out in the correct proportions, and are then mixed with water and with liquid ingredients containing the vitamins and minerals. This mixture is then heat dried by the roller process. In their passage in a thin layer over the heated rollers the cereal ingredients receive an adequate degree of cooking, and the end product is a fine powder with a high degree of digestibility.

The packing of *Farex* is essentially similar to that of *Ostermilk*. The product is weighed automatically into 10 oz. bags which are provided with a band of heat-sealable material near the mouth. After sealing, the bags are placed in cartons, which are themselves closed and sealed. All operations are fully automatic and take place in enclosed plant, so that exposure of the product to the air and to the possibility of contamination with dust or micro-organisms is kept to a minimum. Packing takes place at the rate of 60 cartons per minute.

Protection of goods from aerial contamination is a feature of all the Glaxo packaging lines. Where sufficient covering is not provided by the metal cowlings of the packaging machines, these have been extended with moulded perspex shields, some of them specially placed so as to give added protection from droplet infection from the breath of machine operatives. In addition, the filling lines are totally enclosed wherever possible prior to the sealing of the packages of powdered food.

When it is packed for the overseas trade, *Farex* is filled into paper bags and the bags are then placed in tins with tagger tops. These consist of tins with a normal mouth, designed to take a press-in lid, across which is stretched a thin metal seal. After removal of the lid, the metal seal must be cut away before access can be gained to the contents of the tin. The tins are open at the bottom, from which end they are filled, the bottom then being sealed by a normal double-seaming process. It is thus possible to get a container that is hermetically sealed when it leaves the packing line but can be readily opened and tightly, if not hermetically, closed again during use.

Speciality foods

As well as the baby foods described, Glaxo produce a range of foods suitable for use in illness or under other situations imposing special nutritional requirements. One of these is GlucoDin, a mixture of powdered glucose (dextrose) with crystalline vitamin D, calcium phosphate and calcium glycerophosphate.

In the preparation of this product, glucose, after passing through a 30 mesh screen, is automatically fed to a batch weigher which delivers the appropriate quantities of material to blender below. When the correct amount of material has been delivered, concentrate containing the other ingredients is added. After the batch has been thoroughly blended, it is elevated to a storage hopper from which it passes by gravity to the packing machines. Packing techniques for GlucoDin and other special food preparations are essentially similar to those described for the baby foods.

A comprehensive food

One of the most interesting of Glaxo's foods products is *Complan*, a compounded food containing a balanced mixture of all known essential dietary constituents. At the time of its introduction in 1955, this product was considered to be unique, and it has been described as "the nearest thing yet to the fiction writer's dream of a tablet to replace all other foods." The essential food ingredients having a minimum bulk beyond which further compression cannot be effected, this product must indeed represent almost the final word in food concentrates.

The basic protein constituent of *Complan* is calcium caseinate. In the preparation of the food, this is mixed with purified maltodextrin, which provides the necessary carbohydrates. Fat is added as a source of essential fatty acids, and as a vehicle for the fat-soluble vitamins, A, D, E and K, all of which are incorporated in the food. Six essential minerals, seven vitamins of the B complex, and vitamin C, complete the formula. The powder is packed dry in 1 lb. cartons by the firm's usual techniques.

Each 1 lb. package of *Complan* provides 2,000 calories, and it is

A stage in the manufacture of Complan. Oil soluble vitamins are being incorporated into the Complan blend.

claimed that, given air and water, a normal healthy person could survive indefinitely on the food. If a higher calorific intake is required, sugar or cream may be added as desired. Flavourings such as cocoa, coffee, tomato puree and meat extract may also be added to the food during its reconstitution with water or milk. Apart from its uses in hospitals, where it has been successfully employed for feeding unconscious patients and others who have to be fed artificially, *Complan* is recommended for several domestic uses, including the feeding of convalescents. It is said to be particularly valuable in the case of old people living alone, whose food intake is often inadequate. For such purposes it need not, of course, be employed exclusively, but can be used as a balanced supplement to other foods.

Quality control

Dried powered foods of the type under discussion receive no processing after packaging, and are not sterile products. A very high standard of quality control has therefore to be exercised during their preparation and packaging. This is, of course, particularly so in the preparation of baby foods, for any disturbance of the alimentary system can be of serious consequence where very young babies are concerned.

With the Glaxo milk foods, quality control begins with the original liquid milk. This is subjected to frequent bacteriological checks, and is blended according to fat content to give a fat content in the dried product which is as near constant as possible. Random samples of dried milk are also tested for bacteriological quality.

Before being used in the preparation of foods, each bag of powder is carefully examined, as has already been described. The operators are trained to detect any slight off-odour, particularly where the question of possible rancidity is involved. Any doubtful cases are referred to the analytical department, where the quality of the powder is further investigated by chemical tests. Powder found to be slightly below the high standard necessary for baby foods is used for animal feeding.

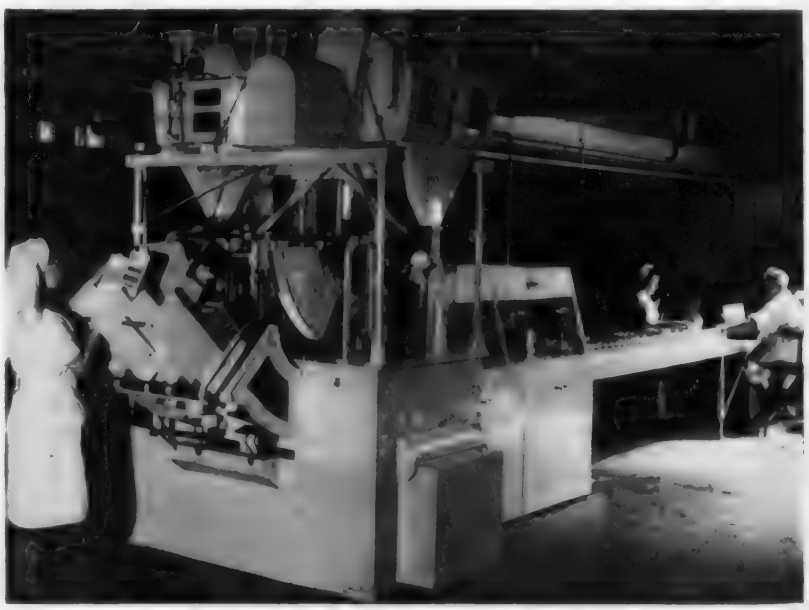
It would clearly be impossible to perform full analyses on all batches of incoming milk powder, particularly in respect of vitamin D, for which a lengthy biological assay is necessary. In order to safeguard against possible omission of the constituents which are added at the drying stage, therefore, factory log sheets are sent from the drying plants to the Greenford factory for scrutiny. Since the cans of milk food are coded, and a record is kept of the batches of milk powder used in their preparation, it is therefore possible for the company to trace back the milk used in an individual can to its original source.

Tests on the finished product are also performed, taste, smell and reconstitution properties being checked. At less frequent intervals, vitamin D content is measured by a rat-growth method of assay.

In the preparation of *Farex*, laboratory control is somewhat more stringent. Frequent checks are made on the content of protein, fat, moisture, minerals and fibre, and snap determinations are performed for vitamin content. The moisture content is of particular importance, as the subsequent keeping quality of the powered food is intimately tied up with this factor.

SOME SUPPLIERS OF EQUIPMENT

Blenders: *Savage and Co., Ltd.*
Mixers: *Artofex Engineering Works, Ltd.*
Screens and feeders: *Locker (Engineers), Ltd.*
Batch weigher: *Henry Simon, Ltd.*
Conveyors: *George Driver and Sons.*
Automatic packing machines: *Autopack, Ltd.*
Metal detectors: *Goring-Kerr, Ltd.*
Seamers and lidders: *The Metal Box Co., Ltd.*
Wire strapping machines: *F. A. Power (Box Strapping), Ltd.*
Fork lift trucks: *Lansing-Bagnall, Ltd.*



General view of the Farex automatic packing machine.

Hollowness in Cucumber Pickles

By Z. Samish, B.Sc., M.A, D. Dimant, B.Sc., and T. Marani*

Fermenting cucumbers are susceptible to the defect of hollowness. Many explanations have been given for this condition, but it has never been satisfactorily prevented. The following account of experiments carried out in Israel throws new and interesting light on the problem.

FERMENTING cucumbers form, at times, internal cavities of varying size. Such cucumbers, known in trade either as hollow pickles, bloaters, or floaters, will decrease appreciably the market value of the finished product.

Conditions which may foster the occurrence of such bloaters have been investigated,[13, 27] and some palliatives, though no remedies, have been suggested; the mechanism responsible for their occurrence seems as yet to be unknown.[25]

The formation of bloaters is known to be affected by the quality of the raw material as well as by the conditions prevailing during its fermentation. Varietal and structural characteristics are often found to be responsible for bloater formation.[3, 14, 25] Thus, small, narrow, firm cucumbers show few cavities, but the larger fruited, more stocky and loosely knit types show comparatively more. Le Fevre[16] states that the faulty nutrition of the plant may be responsible for the abnormal structural development of the fruit. Cucumbers which had been heavily fertilised are thought to be particularly prone to bloater formation, and contracts between farmers and picklers therefore often prohibit the use of nitrogenous fertilisers.[24]

Bloater formation is often attributed to the conditions prevailing during fermentation, such as extremes in salt concentration,[3, 5, 7, 18, 19] the addition of sugar or lactic acid to the brine,[12, 4, 24, 27] or loose packing and insufficient weighting of the fruit in the pickling tanks.[19] A high population of yeast in the brine, generating large quantities of gas, is thought by various authors[6, 7, 13, 14, 25] to be directly responsible for the occurrence of hollows. Jones and Veldhuis[13, 14] compared the composition of the gas collected from the interior of the hollow cucumbers with that evolved during yeast fermentation and found a similar proportion of carbon dioxide and hydrogen in both gases.

The pricking of cucumbers before brining is at times recommended[20] in order to prevent the occurrence of hollowness.

Thus many factors have been found to affect the rate of formation of bloaters; it seems to have been taken for granted, that the gas penetrates from the brine into the cucumbers,[3] although no attempt has been made to explain the mechanism by which the gas passes into the fruit.

MATERIALS AND METHODS

During the summers of 1955 and 1956 the formation of bloaters was studied in the common local variety Beth Alfa, a Damascene type fruit dominating the local market because of its uniformly high yields. Comparative observations were also made with the less popular Ben Shemen variety, which is more slender and firm and has fewer seeds than the former.

A standard method of fermentation served as uniform basis of comparison. Medium-sized Beth Alfa cucumbers, weighing between 70 and 100 g. each, were brined in the laboratory within 24 hr. of picking. The containers used were 3 litre tins with pressure lids and glass tubes, so that brine could be filled up to the rim to prevent scum formation. Gas escaped either through the slit in a heavy walled rubber tube (Bunsen valve) or was collected in calibrated tubes as illustrated (Fig. 1).

These standard batches were covered with a 5·5% salt brine such as is commonly used in the preparation of dill pickles, but no spices were added. The tins were kept at room temperature and the acidity of the brine and the weight and specific gravity of each fruit were recorded.

After complete fermentation each cucumber was cut lengthwise and classified according to the extent of its internal cavities into five groups, as illustrated in Figure 2.

Group 1.—No cavities.

Group 2.—Small cavities.

Group 3.—Medium-sized cavities.

Group 4.—Large cavities, covering between a quarter to a half the length of the cucumber.

Group 5.—Very large cavities, covering nearly the entire seed area.

For the sake of convenient statistical evaluation these 5 groups were later separated into only two by designating all cucumbers of Groups 1 and 2 and half of those in Group 3 as healthy and the remainder as hollows. Such division also resembles common commercial judgment.

The methods employed in our bacteriological studies are described later.

RESULTS

Rate of bloater formation

Of the Beth Alfa cucumbers fermented under standard conditions in 30 experimental batches, about 15-20% developed large or very large cavities, between 20 to 30% developed medium-sized cavities, and the remainder, *i.e.* over half of the fruit, had no cavities or only very small ones.

Differences exceeding this standard treatment by between 20-

* Division of Food Technology, Agricultural Research Station and Hebrew University, Rehovot, Israel.

24% were found to be statistically significant at a 5% level.

Cucumbers were found to change in weight as well as in specific gravity in the early stages of fermentation (Figs. 3 and 4). Weight was lost most rapidly during the first week and the lowest values were reached between the 3rd and 10th day after brining. This loss was followed by a gradual gain in weight, but the fermented cucumbers in no instance regained their original weight within the 30 days of observation.

Such loss in weight may be expected to occur through the extraction of liquid from the tissues by ex-osmosis and through the conversion of fermentable materials into acids and gas. Later liquid and salt will penetrate into the tissues, thus compensating in part for the initial loss.

But the loss in weight of hollow cucumbers was always significantly greater than that of cucumbers which did not develop hollows, and cucumbers which subsequently developed very large hollows would weigh within 5 days of brining only 69% of their original weight.

The specific gravity of cucumbers was affected even more than their weight by their internal condition (see Fig. 4). Firm, non-hollow cucumbers increased in specific gravity after brining, while cucumbers which became subsequently hollow decreased very rapidly in specific gravity. Thus cucumbers with very large cavities which had originally a specific gravity of 0·965 decreased within 9 days after brining to a specific gravity of only 0·802. But after 9 days they invariably started to increase in specific gravity, the rate of regain being in proportion to the size of the internal cavities.

Results show that differences in specific weight of cucumbers between firm, hollow and very hollow cucumbers will not be very significant 3 days after brining, but will be highly significant within 7 days of brining. This early determination of the internal condition of the fruit might be useful for commercial purposes.

Fig. 1. Apparatus used for the study of cucumber fermentation. *Left:* **arrangement for collecting gas.** *Centre:* **Bunsen valve.** *Right:* **Graduated tube with mashed cucumber pulp.**

Effect of raw material upon bloater formation

The extent to which the size and shape of the cucumber may influence the formation of internal cavities is shown in Table 1. Small Beth Alfa cucumbers had significantly far less hollows than either the medium-sized or the large fruit. The slender Ben Shemen variety, however, developed under identical conditions of fermentation only few hollows, while cucumbers of the small-fruited "Model" variety remained entirely free from hollows.

Hollowness was, however, greatly reduced when the cucumbers were pricked prior to fermentation. Accumulation of gas within the pricked cucumber was apparently avoided because of a free exchange of gas between the fruit interior and the brine. Even the large-sized cucumbers exhibited only few bloaters if pricked before brining.

Effect of conditions of fermentation

The progress of lactic acid fermentation will be influenced first and foremost by two factors—the concentration of the brine[18] and the temperature of the medium.[17]

Bloaters are known to appear not only in cucumbers fermented according to the low salt "dill" method, but also in those prepared by the high-salt method.[5, 25] Salt brines varying between 4·5 and 6·5% influenced the degree of bloater formation only slightly, but if concentrations of 7·5% salt were used, approximately twice the number of bloated cucumbers were obtained, as is evident from Table 2. This statistically significant increase was accompanied by a higher weight loss.

Cucumbers fermented at a constant temperature of 22°C. behaved similarly to those fermented at an average room temperature of 24°C., but with cucumbers incubated at 30°C. bloater formation was more than doubled. During the summer of 1956 all fermented cucumbers developed comparatively more bloaters than during 1955, possibly because the summer of 1956 was exceptionally hot; also, the warmer growing season of 1956 may have affected the structure of the fruit.

Formation of bloaters could be readily influenced by the addition of certain chemicals to the initial brine. Thus 1% sugar, which is

Table 1. Relation of Size of Fruit and Pricking to Bloater Formation in Fermented Cucumbers

Name of variety	*Size*	*Original weight of 1 fruit, g.*	*Condition of fruit 11 days after brining*	
			% bloaters	*% weight loss*
Beth Alfa	large	145	65	18·8
	medium	95	29	13·1
	small	53	10	10·2
Ben Shemen	medium	64	8	9·7
Model	medium	51	0	6·3
Beth Alfa	large, pricked	134	14	—
	medium, pricked	95	0	4·9

added at times to enhance the rate of fermentation,[15] increased bloaters very significantly to up to 74%.

Alum—$KAl(SO_4)_2$—which is at times used in industry to harden the cucumber tissue,[9] increased the degree of bloater formation very significantly, as shown in Table 3.

In contrast to alum, sodium benzoate, which is known to suppress yeast development[1] and therefore to increase the keeping quality of the pickles after the containers are opened, reduced bloater formation very significantly at concentrations of between 500 and 750 p.p.m.

During fermentation under standard conditions the acidity of the brine increased from an average of 0·35% on the third day to about 0·65% on the seventh day after brining, and attained about 0·75% lactic acid after the tenth to eleventh day. The addition of alum depressed acid formation, while the addition of sugar fostered a more rapid initial accumulation of acid, but did not result in a higher final lactic acid concentration.

The quantity of gas evolved from a standard 3 litre can containing 1·5 kg. of cucumbers varied anywhere between 200 to 500 c.c., higher values being recorded when alum was added to the brine. If 1% $CuSO_4$ was added to the brine, so as to prevent fermentation, small quantities of gas were evolved during the first day but none thereafter. The interior of such intensely green cucumbers was, however, not always unchanged, but showed at times many small gas pockets surrounding the individual cucumber seeds.

No correlation whatsoever was found between the proportion of hollow cucumbers in a lot and the quantity of gas evolved. In order to find whether gas may find its way from the brine into the interior of the cucumbers, many different lots were fermented in tanks kept at a pressure of between 8-10 p.s.i. The rate of fermentation as well as the percentage of hollow pickles in such lots were very similar to those kept under atmospheric pressure.

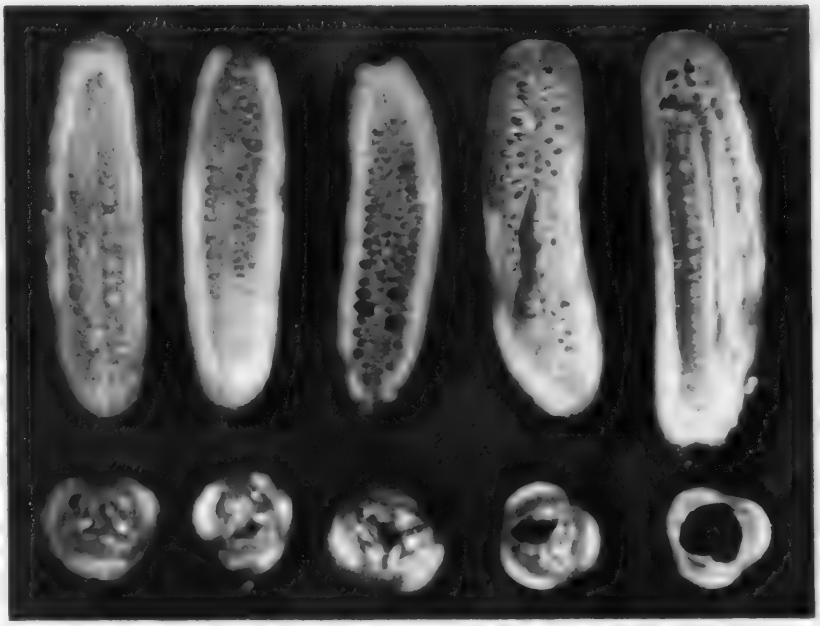


Fig. 2. Fermented cucumbers, variety Beth Alfa. The longitudinal and transverse sections show the effect of different degrees of hollowness, which increases from left to right.

Microflora within the cucumbers

Fermented, hollow cucumbers were cut lengthwise with a flamed knife, and tissue surrounding the cavity was transferred into yeast-infusion glucose agar with Brom-Cresol Green as indicator. These specimens in all instances contained acid-producing bacteria. No yeasts were ever found in any of these isolates.

If suspensions of lactobacilli or yeasts were inoculated into the original brine or injected into the fresh cucumber before brining they did not cause an increase in bloater formation. Yeast increased gas production, but when yeasts were inoculated into the fruit bloater formation decreased significantly, possibly due to the ready escape of gas through the injection wound.

It is generally taken for granted that the inner tissue of the fresh, normal, healthy fruit is sterile. This assumption was, however, not confirmed by our experiments. The presence of micro-organisms was established as follows: the surface of fresh, well-scrubbed cucumbers was sterilised with either mercuric chloride solutions or alcohol; the cucumbers were then dissected aseptically, and tissue was transferred to nutrient media and incubated.

Three techniques of work were employed:

(*a*) A mashed cucumber pulp was diluted with an equal volume of brine to which 0·3% yeast extract was added (Fig. 1).

(*b*) Cubes of the inner flesh of cucumbers were immersed in a bacto-nutrient broth with added glucose and yeast extract.

Table 2. Formation of Bloaters in Cucumbers Brined with Varying Salt Concentrations

% salt in brine	Temperature during fermentation	Observations 11 days after brining	
		% hollows	% loss in weight
4·5	room*	25·3	13·2
5·5	room*	26·7	13·2
6·5	room*	22·2	10·8
7·5	room*	56·2	20·9
5·5	22°C.	23·6	—
5·5	30°C.	61·0	—

* Approximate mean temperature 24°C.

(*c*) Cross-sections of whole cucumbers were imbedded in a yeast infusion glucose agar with Brom-Cresol Green as indicator.

After incubation of the specimens, the growth of micro-organisms was determined either by the appearance and accumulation of gas or by the turbidity of the broth. In the embedded cucumber slices, active microbial growth became evident by the appearance of colonies of bacteria, by a change in the colour of the indicator from blue to green, and later to yellow, as well as by gas forming small pockets or fissures in the substrate (Fig. 5). Gas and acid-producing bacteria were isolated from these specimens.

Two negative control tests consisted of:

(*a*) Samples prepared as described above, with the sole difference that the cucumbers had been autoclaved prior to dissectioning.

(*b*) Surface-sterilised cucumbers cut lengthwise and placed upon moistened yeast infusion agar plates in such manner that the peel surface only came into contact with the medium.

These control samples remained sterile in all cases.

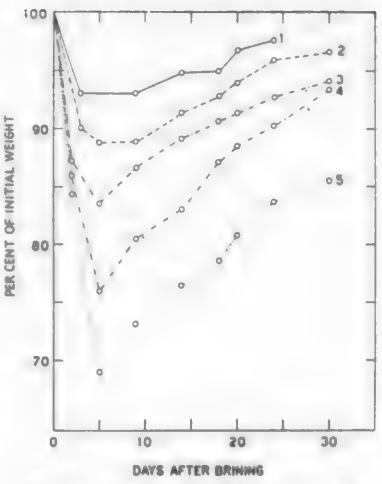
At eight different dates cubes were extracted from four locations within the surface-sterilised cucumbers as well as from autoclaved ones and incubated in nutrient solution. The turbidity of the specimens three days after incubation is recorded in Table 4.

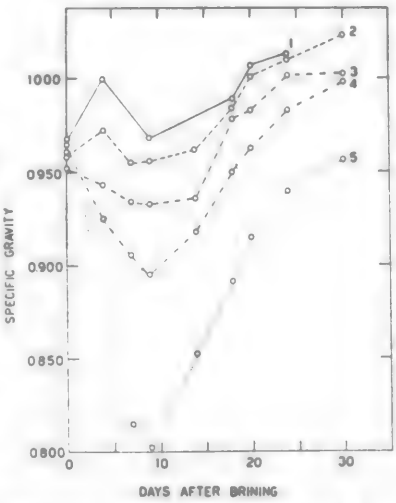
It may be concluded from the above results that the inner tissue of fresh cucumbers is not always sterile; micro-organisms were found in all four sectors of the fresh cucumber, but they were less frequent in the cubes dissected from the periphery, just below the fruit peel.

DISCUSSION

It has been attempted in this study to evaluate the factors affecting hollowness in cucumber pickles.

The percentage of bloaters recorded in these trials under standard conditions appears to be quite typical also for other countries, since between 3 to 33% of bloaters have been reported by various investigators[7, 13, 27] for low-brine cucumbers to which neither sugar nor acid has been added. Such data may not be quite comparable, however, since judgments of the relative degree of hollowness are likely to differ.





Figures 3 and 4. Weight (*above*) and Specific gravity (*below*) of fermenting cucumbers, grouped according to relative size of cavities.

Size of cavities.
1. **None.**
2. **Very small.**
3. **Small.**
4. **Large.**
5. **Very large.**

The tendency of cucumbers towards bloater formation increases directly with the size of the fruit and can be best increased by the addition of alum salt to the original brine. Alum, used commercially as hardening agent for pickles[9] apparently affects the toughness of the fruit skin.

Factors which increase the rate of fermentation, such as higher temperatures and the addition of sugar to the brine, were also found to increase bloater formation. These results are confirmed by the findings of Fabian,[8, 11] who states that losses through bloaters are larger in the southern U.S. than in the northern states. Veldhuis[27] and Jones[12] report up to 90% of bloated cucumbers when sugar has been added to the brine.

Our data may help to shed some light on the mechanism responsible for the appearance of bloaters. It seems that the gas which accumulates in bloaters is formed inside the fruit and does not have its origin in the brine. Indeed, the addition of yeast to the brine increased gas formation within the brine but did not affect the percentage of bloaters, even if fermentation took place under pressure of up to 10 lb. per square inch.

It can be assumed that bloater formation starts in the vicinity of the central axis of the cucumber soon after brining.

The very rapid progress of this process can be followed by plotting the weight and specific gravity of the fermenting fruit, and their decrease may help to detect potential bloaters as early as 3 days after brining.

This early start of gas-pocket formation is emphasised particularly if fruit of large size is used, or if fermentation progresses at comparatively high temperatures; but bloater formation can be avoided entirely if gas escape routes are opened by pricking the fruit before brining. In fruit of larger size, or in alum-treated fruit, however, the escape of gas appears to be physically hindered.

It thus remains to find the origin of these gases. Anaerobic respiration of the tissues would not seem to explain adequately such a rapid formation of gas pockets. On the other hand, the microflora in the brine are known to produce gas of a composition similar to that found in bloaters.[13, 14] But a time interval would seem to be necessary for the entrance of micro-organisms from the surrounding liquid into the centre of the fruit, and one

Table 3. Effect of Additions of Alum and Sodium Benzoate upon Bloater Formation

Addition to brine	% bloaters formed after 11 days
None	25·4
Alum 1,000 p.p.m.	61·8
,, 2,000 p.p.m.	71·7
Sodium benzoate 500 p.p.m.	7·1
,, ,, 750 p.p.m.	9·8

Table 4. Growth of Micro-organisms from the Interior of Fresh Cucumbers in Nutrient Solutions Three Days after Incubation

Condition of cucumbers	Sectors obtained from	Total samples from each	No. of turbid samples	% of turbid samples
Fresh fruit	(1) periphery	25	9	36
	(2) blossom end	25	15	60
	(3) centre	25	15	60
	(4) stem end	25	17	68
	Total	100	56	
Autoclaved fruit	(1) periphery	27	0	0
	(2) blossom end	27	0	0
	(3) centre	27	0	0
	(4) stem end	27	0	0
	Total	108	0	

would expect this process to be slower in the larger fruit. Gas formation in larger fruits would therefore be slower than that in smaller fruit, which is clearly not the case.

It thus becomes probable that the bacteria are present in the tissue of the cucumbers, a contention which is supported by bacteriological evidence.

We hesitated to come to this conclusion, since according to general assumption no microflora are present within the interior of healthy fruits. But results remained consistent and bacterial cultures have been isolated from the interior of the fresh cucumbers again and again by different techniques.

Additional supporting evidence from the point of view of technique is furnished by the finding that samples closer to the cucumber skin contained fewer bacterial cultures than those close to the interior.

Our observations give as yet no indication concerning the origin or the place of entrance of the micro-organisms into the fruit. But attention should be called to the fact that the presence of micro-organisms within normal, healthy fruits and seeds has been reported before. Thus, Schanderl[22, 23] found micro-organisms within various fruits and seeds, including cucumbers. Working with plasmolysed tissue, he obtained bacterial growth in about 90% of the tested cucumbers, all of them lactic acid producers. In a publication on medical bacteriology, Rusch and Kolb[21] describe the successful isolation of bacteria from within cucumbers and other fruits. Burcik[2] and Tonzig and Bracci[26] have reported bacteria in up to 90% of their samples obtained from miscellaneous plant organs. Hollis[10] reports the occurrence of bacteria in healthy potato tissue.

While Burcik thinks that the micro-organisms may have gained entrance into the tissues through the stile, Schanderl believes that the bacteria pre-existed within the cells.

The existence of bacteria inside the tissue of fresh cucumbers may also explain the inconsistent results which most scientists have obtained when they attempted to influence the progress of the lactic acid fermentation of cucumbers by the addition of pure cultures.

SUMMARY

(1) Fermenting cucumbers change rapidly in weight and specific gravity within the first week after brining.

(2) Cucumbers which develop internal cavities decrease rapidly in weight and specific gravity soon after brining, the extent of the cavities being proportional to the early losses in weight and sp. gr.

(3) The tendency towards formation of cavities inside the fruit increases with the size of the fruit, the temperature prevailing during fermentation, and the concentration of the salt brine.

(4) The appearance of internal cavities is reduced when benzoate is added to the brine or when the fruit is pricked before fermentation.

(5) Gas- and acid-producing bacteria were found inside the tissue of fresh cucumbers.

(6) It is suggested that the cavities in cucumbers are caused by micro-organisms within the fruit.

Agricultural Research Station, Rehovot, 1956 *Series. No.* 171*E.*

Fig. 5 Formation of gas pockets in fermenting cucumbers

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Freezing Fresh Food

IN the preparation of this third edition* of their well-known book, the authors have been assisted by a number of specialists who have contributed chapters on their own subjects. Consequently the whole field is now covered with encyclopædic thoroughness, and the book itself has attained commensurate proportions. The thirty-one chapters in this first volume cover every aspect of the freezing of fresh fruits, vegetables, meat, poultry, fish, and dairy products —aspects economic, scientific, technological, and hygienic. There are chapters on the marketing of frozen foods, on their transportation, on frozen food cabinets for retail sale, on domestic and on industrial freezers; there is even a chapter on the cooking and serving of frozen foods. The most unlikely materials are covered in greater or less detail, according to their importance; for example under the heading "Handling of Small Game" are instructions for the preparation of raccoon, muskrat, and rabbit. Quite clearly the authors have set out to cover the entire field of frozen foods, and within the limits they have set themselves for Volume I they appear to have succeeded in doing so.

It might be expected that such a wide coverage coupled with the inclusion of special chapters by other authors would lead to undesirable repetition, possibly even to an occasional contradiction. It does not seem to have done so. There is, of course, a certain amount of repetition, particularly in the opening paragraphs of chapters, but it has hardly reached noticeable proportions. Of the 282 illustrations, however, quite a few are unnecessary and others are uninformative, and it might be as well to cut out some of them when the next edition is prepared.

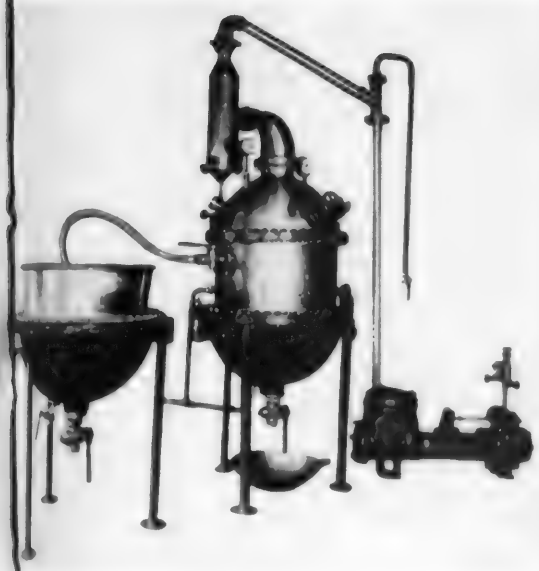
Most of the text is written in a style which is pleasant to read and easy to understand. There are, however, some black spots where the note-book style of composition has crept in. This involves the omission of occasional small words —most frequently the definite article is dropped—which results in an uneven flow of the language, and a corresponding interruption of the reader's comprehension. In all fairness, however, it must be recorded that there are very few sentences in this book which will not be understood as easily in fifty years' time as they are today.

"Tressler and Evers" is clearly destined to be and to stay *the* reference book for the industry. It is therefore important that the index should be both accurate and adequate; it appears to fulfil both requirements.

There is so much detail in this first volume that one would be at a loss to know what subjects are left for consideration in Volume II if the authors had not given this information in their preface; briefly, they will cover all manner of prepared and cooked foods. If they complete their task with the same success as they have reached the half-way stage, then *The Freezing Preservation of Foods* by Tressler and Evers will become as much a part of every factory as the freezer itself.

DENIS DICKINSON.

* *The Freezing Preservation of Foods.* Vol. I—*Freezing of Fresh Foods.* By D. K. Tressler and C. F. Evers. Third Edn. Avi Publishing Co. Inc. 1957. Pp. xxii + 1214. Illustrated.



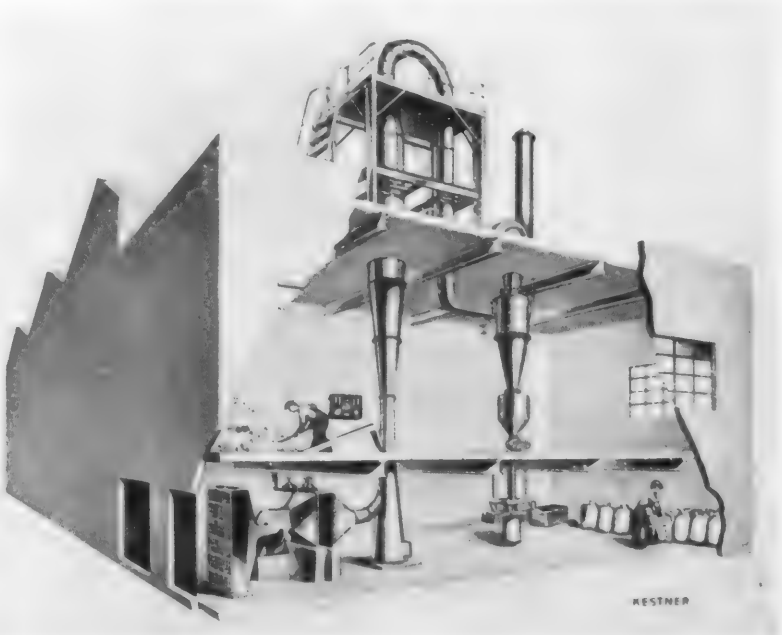
Manufactured by Brierley, Collier and Hartley, the vacuum pan illustrated is designed for the evaporation of viscous liquids.

EVAPORATION AND DEHYDRATION

"FOOD MANUFACTURE'S" TECHNICAL SURVEY

The chief constituent of most foods is water. With the rising cost of transport and storage, efforts are continually being made to remove this water, to reduce the bulk and weight of the foods. The removal of water also greatly increases the storage life of many commodities. This survey reviews modern trends in this important branch of food manufacture.

* Modern Evaporators for the Food Industry
* Quick-Cooking Dehydrated Vegetables
* Recent Studies on Dehydration
* Increasing Dehydration Efficiency
* Evaporation and Dehydration Equipment



An impression of Kestner's Thermo Venturi *drier for powdered foods such as starch, cocoa, etc. The powder is dried in a current of hot air, from which it is separated in a cyclone separator.*

MODERN EVAPORATORS FOR THE FOOD INDUSTRY

By C. Armstrong, B.Sc.(Eng.), A.C.G.I.,* N. R. Bell, B.Sc.,* and H. D. Murray, A.R.T.C.*

The concentration of liquors by evaporation is but one aspect of the more general problem of heat transfer to boiling liquids. This unifying action of the chemical engineering approach is of considerable value, since it means that in considering the evaporation of food products much of the data obtained from studies in the boiling of other liquids may be applied. It is the purpose of the article to describe the more recent developments in the design of evaporators and at the same time to indicate some of the fundamental aspects of the general problem of heat transfer to boiling liquids.

DURING the last few years expansion in many industries has led to a substantial amount of work on evaporators and their auxiliary equipment. Industry has become increasingly aware of the importance of using the correct type of evaporator for the job, and investigations have been made on various problems.

This is especially true of the food industry, where the highly labile nature of many food constituents has posed serious problems. Important flavour constituents may be lost by the use of unsuitable equipment or operating techniques, and undesirable colours and flavours may be introduced into the products.

It is necessary, therefore, before reviewing the different types of evaporator, to consider the special demands which the industry places on the evaporators it uses. These are:

1. Low absolute temperature of the liquor.
2. Low-temperature difference between the heating fluid and the liquor.
3. Short time of residence of the liquor in the evaporator.

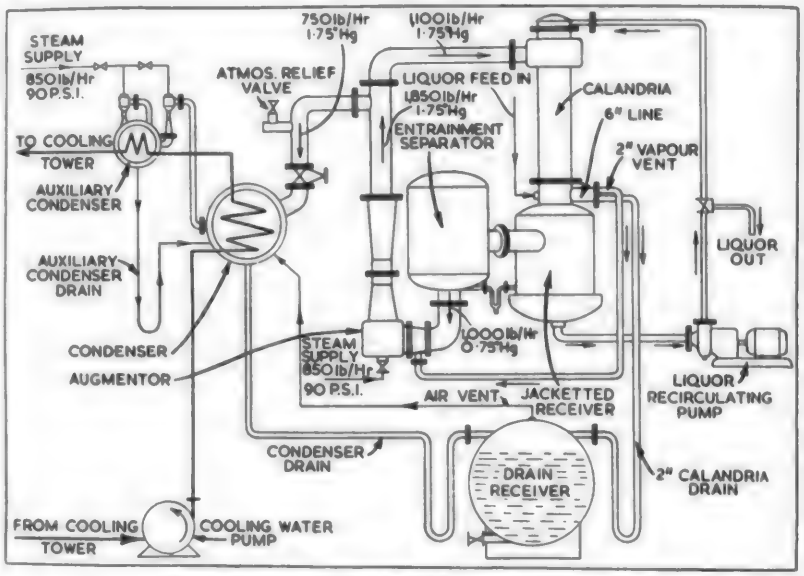
These factors all arise from the previously mentioned extreme heat sensitivity of the products involved.

1. Low absolute temperature

The highest evaporation temperature which can be tolerated in most cases is substantially below 212°F., so that operation under vacuum is essential.

How critical a factor the evaporation temperature can be is illustrated in a paper by Walker, Nimmon and Patterson.[1] They describe how evaporation of a citrus juice was carried out at 130°F. with no detrimental effect on flavour, but when the evaporation temperature was raised to 145°F. a significant deterioration in flavour was observed. Many products can with benefit be evaporated at temperatures well below the example quoted above, and the need for these low evaporation temperatures has led to the development of evaporators incorporating heat pump cycles. A description of one of this type is given later.

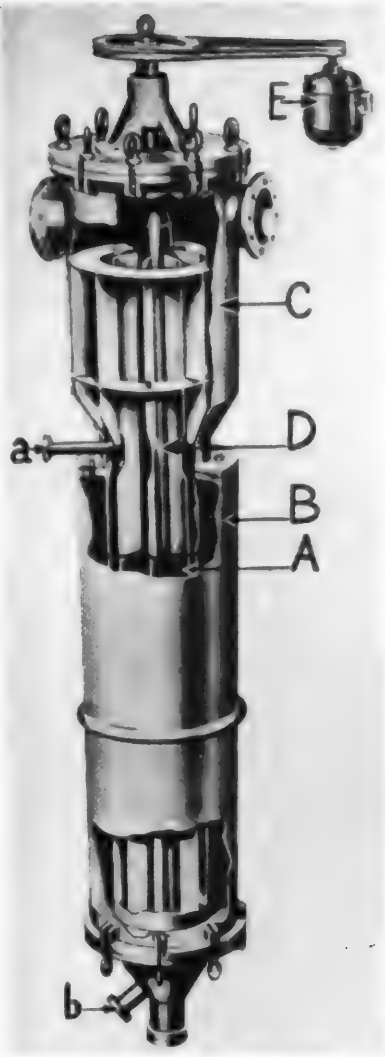
Kelly[2] presented a general paper on low-temperature evaporation in which he came to the conclusion that heat-sensitive materials are preserved more easily by rapid evaporation at low temperatures. He also pointed out that the scaling up and corrosion of evaporators is much reduced by operation at low temperatures. The rate of corrosion of mild steel by salt solutions at 68°F. is only one-quarter of that at 140°F. A further advantage of low-temperature operation is the increase in strength it confers on certain constructional materials such as plastics and lead.



International Chem. Eng. and Process Industries (now Chemical and Process Engineering).

Fig. 1.—Arrangement of falling film recompression evaporator for the concentration of liver extract.

* Department of Chemical Engineering, King's College, University of Durham, Newcastle Upon Tyne, 2.



Chem. and Process Eng.

Fig. 2.—Luwa evaporator working on thin films.

2. Low-temperature difference

A low-temperature difference between heating fluid and liquor is necessary if local "hot spots" on the liquor side of the tube wall are to be avoided. A corollary of this requirement is that a high heat-transfer coefficient between tube wall and liquor is necessary, otherwise the heat flux will be too small to give reasonable evaporation rates. This in turn means a high degree of turbulence in the liquor, either naturally induced, or artificially by high pumping rates. It should be possible to operate film-type units with an overall temperature difference as low as 20°F.

3. Low residence time

The sensitivity of many of the products of interest is related not only to the maximum temperature reached but also to the duration of exposure to this temperature. The residence time of the liquor in the evaporator is therefore of importance in designing food processing plant.

In the paper of Walker, Nimmon and Patterson[1] a tubular evaporator with the particularly low transit time of 2 sec. is discussed. Schwartz[3] has given a comparison of various systems for low - temperature evaporation. Economically the multiple effect systems are attractive, but a single pass system of 14 bodies in series had a transit time of 6 min. with a maximum product temperature of 60°F., while a double effect recirculation system had a transit time of 30 min. with maximum temperatures in each effect of 75°F. and 57°F. respectively. From recent work it is now believed that a very high percentage of vaporisation can be achieved in one pass through a climbing film evaporator and there is little, if any, justification for recirculation.

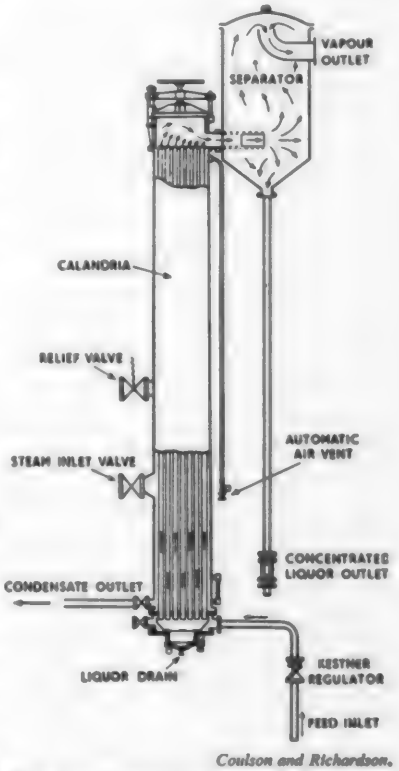
EVAPORATOR TYPES

Two of the most suitable types of unit for handling food products are forced circulation and film-type units. With high rates of forced circulation it is possible to obtain high values of heat flux but at present all these units demand a considerable residence time. Stainless-steel forced circulation units are particularly suitable in handling viscous liquors and those which deposit crystals.

Falling film evaporators

These are extensively used in the citrus juice and food industries. They consist of a vertical tube bundle heated by condensation of steam on the outer surface. Liquor is fed to the top of the tubes and allowed to flow downwards on the inside of the tube surfaces, the resulting vapour and concentrated liquor flow into a separator at the foot of the evaporator, or the liquor may be taken off at the foot of the column and the vapour drawn off at the top. An example of this type of evaporator is shown in Fig. 1. The advantages claimed for the falling film evaporator are short residence time, good performance with small temperature drop across the heating surface and relatively low pressure drop, factors which suggest that it is very suitable for further consideration.

A new form of falling film evaporator has been developed by Luwa S.A. of Zurich. These units, as illustrated in Fig. 2, consist of a vertical tube A, the lower portion of which is surrounded by a jacket B which contains the heating medium. The upper part of the tube A is not jacketed and acts as a separator. A rotor D driven by an external motor has blades which extend nearly to the bottom of the tube and have only a small clearance between the tip and the jacket. The liquid to be concentrated enters A and is picked up by the rotating blades and thrown against the wall of the tube. This action provides a thin film of liquid and sufficient agitation to prevent



Coulson and Richardson.

Fig. 3.—Kestner long tube evaporator.

local overheating. The film flows down by gravity, becoming concentrated as it falls. The concentrated liquor is run off from the bottom through a pump and the vapour leaves at the top of the unit, where it passes either to a barometric condenser or to a surface condenser.

Climbing film evaporators

The first successful climbing film evaporator was developed by Kestner in 1909. In the type shown in Fig. 3 the weak liquor is fed to the foot of the tube almost at its boiling-point. The effect of vapour generation in the tubes produces a central core of vapour which rapidly rises up the tube, dragging a film of liquid on the tube wall. This type of unit seems to be gaining favour owing to the short time of contact of the liquor with the hot surface (a matter of seconds), the small temperature difference required and the relatively simple mechanical construction.

An interesting combination of the two film types is the climbing and falling film evaporator, with all the tubes inside the same steam shell. This is a very economical method of achieving a higher percentage evaporation of the feed than is obtainable with a single pass climbing film unit.

Considerations of heat transfer

Fig. 4 shows the relation between the heat flux obtained and the temperature difference when boiling a liquid on a submerged surface. In stage 1 with very low Δt the heat flux is low but rises slowly with increase in Δt. This is a condition of natural convection heating. In stage 2 and more definitely in stage 3 the heat flux rises rapidly with an increase in Δt and these are the useful stages of operation. In these stages agitation of the liquid is achieved by the rapid formation of bubbles. Finally, so much vapour is produced that it tends to blanket the heating surface from the vaporised liquid and the heat flux falls. Stages 4, 5 and 6 are therefore of no practical interest in this connection.

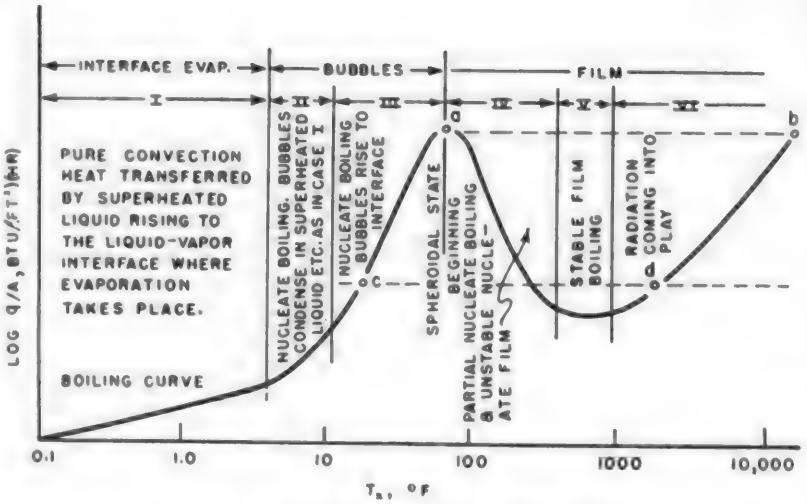


Fig. 4. Physical interpretation of boiling curve.

Heat transfer in climbing film units

Coulson and Mehta[4] used a 5 ft. stainless-steel tube ½ in. i.d. and evaporated under vacuum, water, *Teepol* and sucrose solutions, these solutions being fed at their boiling-point to the foot of the tube to eliminate the non-boiling section. They were able to show that if the liquid was at its boiling-point then

$$h_b = K(\Delta t^{0.6} \quad W_f^{0.28} \quad \mu_-^{0.49})$$

They also pointed out that high values of h_b can be maintained even though a very large proportion of the feed was vaporised.

Coulson and McNelly[5] using 5 ft. tubes of varying diameter were able to operate with a much higher range of Δt and showed that three distinct conditions might be obtained (Fig. 4a). Over the condition of low-temperature difference which occurs industrially $h_b \propto \Delta t^{0.53}$ and over this range a high rate of heat transfer is obtained by the pumping action of the high-velocity vapour that is formed. Over this range the values of h_b for a given Δt are much greater than that obtained with natural convection.

At high ranges of Δt the agitation is overwhelmingly due to bubble formation and the value of heat flux obtained corresponds to that for normal boiling conditions. Climbing film evaporators should not be worked in this region as

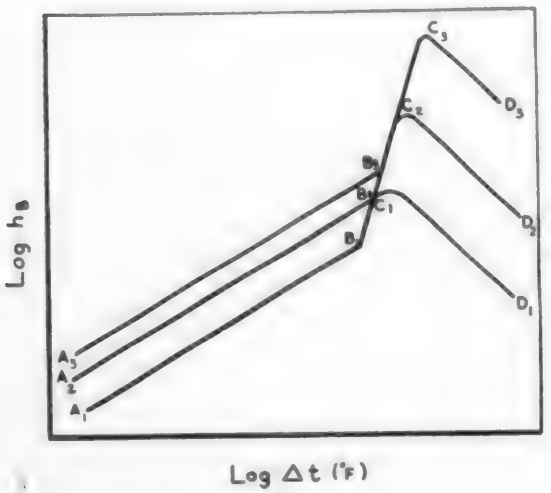
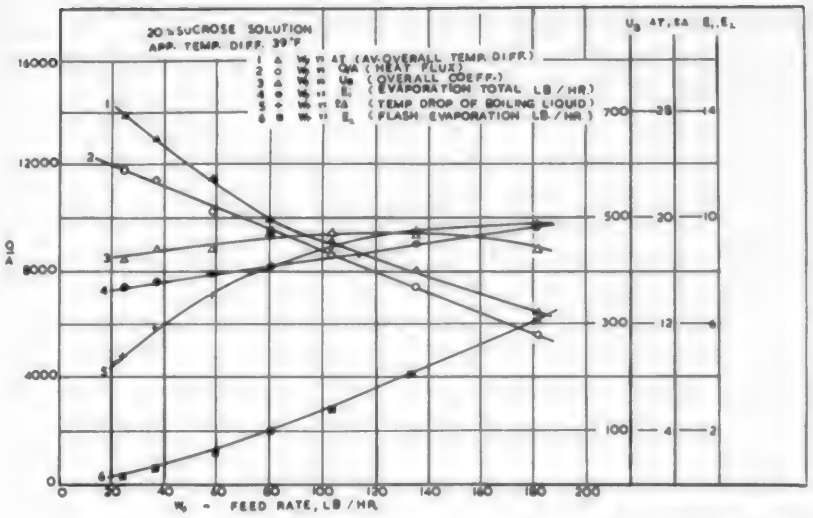


Fig. 4a. General form of relationship between film transfer coefficient and film temperature difference.



Coulson and Mehta.

Fig. 5. Influence of feed rate on working of evaporator.

they offer no advantage over normal types. With very high-temperature difference all the feed becomes vaporised and dry spots appear on the tube surface, and under these conditions the heat flux drops off.

It has been shown certainly for vacuum conditions that increase in the feed rate always increases the transfer coefficient with same temperature difference. This is illustrated in Fig. 5.

It is very difficult to calculate the value of transfer coefficients for solutions in which the viscosity changes rapidly with concentration.

Coulson and McNelly[5] gave a generalised equation for calculating the heat-transfer coefficients in the form:

$$Nu = (1{\cdot}3 + Cd)\ Pr_L^{0{\cdot}9}\ Re_L^{0{\cdot}33}\ Re_V^{0{\cdot}34} \left(\frac{\rho_L}{\rho_V}\right)^{0{\cdot}25} \left(\frac{\mu_V}{\mu_L}\right)^{10{\cdot}}$$

An alternative equation has been given by Kirschbaum,[6] who worked with a copper tube heated by condensing steam. He presented his results in the form:

$$\frac{h_{fg}a}{k_L\rho} = \text{const.} \left(\frac{\Delta t.c}{\lambda}\right) \left(\frac{\rho_L}{\rho_V}\right)^{\frac{1}{2}} \left(\frac{\eta_L \text{ wat}}{\eta \text{ liq}}\right)^{\frac{1}{2}}$$

An all stainless steel unit using a 10 ft. × 1 in. i.d. tube has recently been erected in this laboratory and is being used for further studies in this field. This type of unit is illustrated in Fig. 6, from which it is seen that the liquor is stored in one of the large vessels on the ground, is pumped to a feed tank positioned above the top of the condenser where it is heated almost through its boiling-point. Flow is by gravity through a final heater so that it enters the bottom of the tube at its boiling-point. The unit is heated by low-pressure steam supplied from a small boiler. Arrangements are made to measure the temperature of the liquor inside the long tube and at points along the wall. Some results with this unit are shown in Fig. 7. The unit is operated at atmospheric pressure, and under these conditions the feed rate has very little effect on the heat flux unless a weak solution is being concentrated very substantially in its passes through the unit.

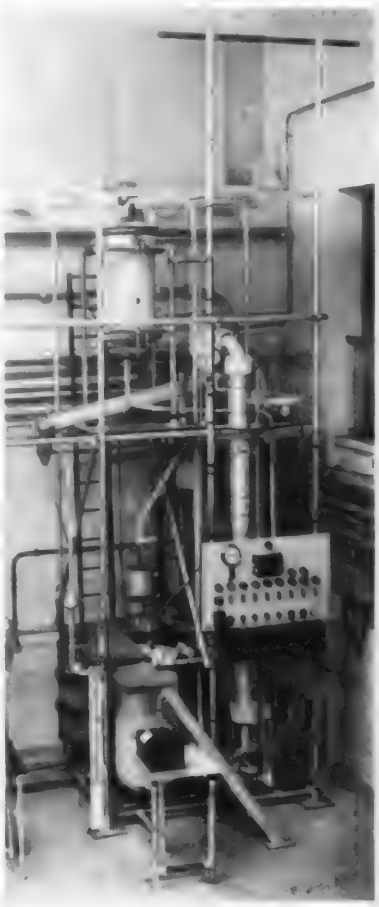
SOME SPECIALISED UNITS

1. Vapour recompression

In order to improve the utilisation of heat, part of the vapour output from the evaporator is upgraded to the condition of the original heating steam. The cycle is only worthy of consideration when the temperature difference between heating steam and evaporating liquor is small, as it is impossible to raise efficiently the steam conditions by a large amount.

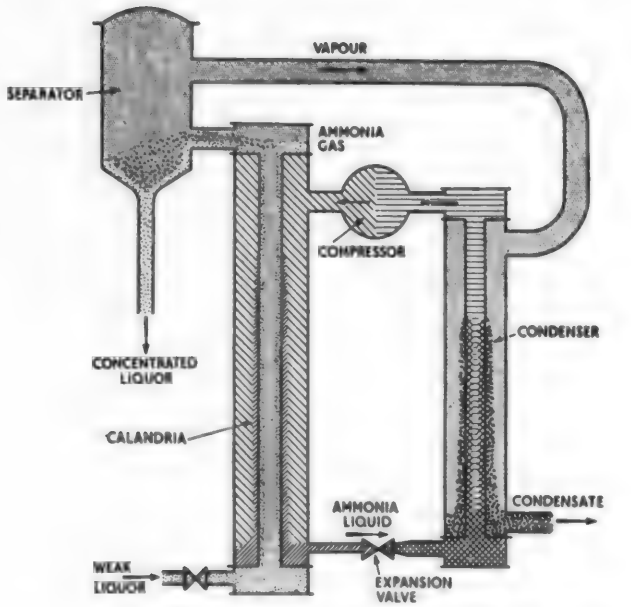
Mechanical compressors or steam jet ejectors may be used to improve the steam quality, but mechanical compressors are not suitable for large quantities of vapour, though rotary compressors of the Rootes type have been used for small and medium size units. A small diesel-engined recompression unit has been developed by the Manistee iron works of Michigan,[7] the engine also supplying the process heat from its exhaust and cooling systems.

Steam jet ejectors are used in the evaporator shown in Fig. 1. High-pressure steam is injected through a nozzle and low-pressure vapour is drawn in at right angles through a second nozzle, the issuing jet of mixed steam passing out to the calandria. Where high-pressure steam is available these units have considerable advantages over the mechanical type, they can handle large quantities of



Dunsmoir.

Fig. 6. Climbing film evaporator for research.



Coulson and Richardson.

Fig. 7. Heat pump cycle using ammonia.

vapour, are of simple construction and may be made of non-corrosive materials. They are of most use when the temperature difference is small, the efficiency being reduced with increasing compression. Turbo compressors and thermo compressors are discussed by Choquet,[8] and Tromp has discussed the economics of thermo compression in two papers.[9, 10]

2. The heat pump cycle

As has been previously mentioned, the need for low temperatures has led to the development of the heat pump cycle, employing normal refrigeration fluids, for evaporator operation. The principle of a heat pump cycle using ammonia is shown in Fig. 8, where the ammonia is condensed in the calandria, cooled and boiled in the condenser.

Prashan[11] gives details of a three-pass single effect system and triple-effect units working on this principle. In this case a rotary compressor is used with *Freon* as the heat-exchanger medium. The hot *Freon* from the compressor is cooled with water which is so heated to 90°F.; this heats the first effect and is thereby cooled to 80°F. before being recirculated through the *Freon* cooler. The *Freon* is further cooled by expansion and then used to cool water to 37°F. which is put through a barometric condenser to condense the vapour from the third effect. The water, then at 45°F., is recirculated through the cold *Freon* exchanger to be again cooled to 37°F.

Kelly[2] has shown that a low-temperature single effect unit working on a heat pump cycle similar to that described above is equivalent in heat utilisation to a four-effect system of normal design.

Nomenclature

h_b	boiling film coefficient B.Th.U./ft.²hr. °F.
Δt	temperature difference across boiling film, °F.
W	feed rate lb./hr.
Q	heat flux per unit area B.Th.U./hr.ft.²
U	overall heat-transfer coefficient B.Th.U./ft.²hr.°F.
P	pressure lb./ft.² abs.
k	thermal conductivity B.Th.U./hr.fc.°F.
c	specific heat B.Th.U./lb.°F.
d	tube diameter ft.
L	tube length ft.
μ	viscosity lb./ft.hr.
ρ	density lb./ft.³
λ	latent heat of vaporisation B.Th.U./lb.
σ	surface tension lb./hr.²

Subscripts:

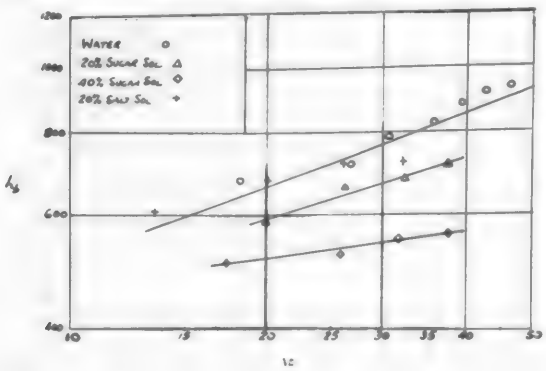
L	liquid.
v	vapour.

$Nu = \frac{h_b d}{k_L}$ Nusselt group

$Pr_L = \frac{c\mu_L}{k_L}$ Prandtl group.

$Re_L = \frac{4W_f}{\pi d \mu_L}$ Reynolds group for liquid.

$Re_v = \frac{4QL}{\lambda \mu_v}$ Reynolds group for vapour.



Dunsmoir.

Fig. 8. Typical results from research climbing film evaporator.

Acknowledgments

We are indebted to Mr. N. I. Dunsmoir for permission to reproduce his data in Fig. 7, and to Professor J. M. Coulson for giving assistance in preparing the manuscript.

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QUICK-COOKING DEHYDRATED VEGETABLES

By E. G. B. Gooding,* M.A., M.I.Biol.

In the past, most dehydrated vegetable products have required lengthy soaking and cooking, and this has contributed to their unpopularity. Modern methods of dehydration are overcoming this drawback, and in this article Mr. Gooding gives an account of the latest developments in this field.

ONE of the less attractive features of most dehydrated root vegetables is the lengthy period of time necessary between opening the package and the appearance of the contents in edible form. Many of these products require soaking for an hour or more before cooking. Recent work[1, 2] has shown how the soaking time may be shortened or even eliminated, but the period of cooking has remained rather long in most cases. Reduction in cooking time would be of obvious advantage in the domestic kitchen, in the catering establishment or Army cookhouse, and to the manufacturer of such products as dried soup mixes. The possibility of improving dehydrated vegetables in this respect is being investigated at Aberdeen, and some progress has been made.

Cooking of the vegetable before dehydration, combined with measures to accelerate water uptake by the dehydrated product, seem to be the essential pre-requisites, and there is, in fact, a well-known commercially produced example of such a product, namely mashed-potato powder, in which potatoes are cooked, separated into individual cells or small clusters of cells, and dehydrated. The finely divided state of the product allows rapid rehydration (reconstitution) when hot water is added, and no further cooking is required. Since most root vegetables are not, however, normally consumed in purée or mashed form, it is desirable to prepare precooked or quick-cooking dehydrated root vegetables in larger portions, *e.g.* dice. The main lines of approach in the present studies, and the results so far obtained, are outlined below.

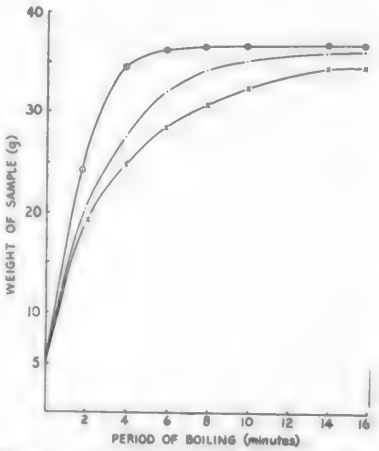

Fig. 1. Reconstitution of pre-cooked dehydrated carrot dice of different thicknesses. (Weights of 5 gm. samples after boiling in water).

o——o $\frac{1}{16} \times \frac{5}{16} \times \frac{3}{8}$ in.
•——• $\frac{5}{32} \times \frac{5}{16} \times \frac{3}{8}$ in.
x——x $\frac{1}{8} \times \frac{5}{16} \times \frac{3}{8}$ in.

COOKING

Cooking the whole vegetable before dicing has not been satisfactory in most cases, as the cutting machinery will not handle the relatively soft cooked tissues. Cooking the cut material in water leads to excessive losses of dry matter and flavour by the leaching out of solutes; cooking in steam gives much smaller leaching losses and more satisfactory results, and this technique has been used in all experiments, except for a few instances in which pressure cooking was employed on a small scale.

DRYING

Hot-air drying

The rate of reconstitution of dehydrated root vegetables is closely related to the minimum dimension to which the pieces are cut before dehydration. For example, if they are to reconstitute fully, potato strips 3/16 × 5/16 in. cross section and of indefinite length require the addition of hot water and soaking for 1-2 hr., followed by 10-15 min. cooking; potato strips only 1/16 in. thinner, *i.e.* 1/8 × 5/16 in. cross section, require no soaking before cooking.

Experiments were carried out with flakes of carrot, swede, turnip, celeriac and parsnip, cut 5/16 × 3/8 in. "square," and with thicknesses of 1/8 in., 3/32 in. and 1/16 in. Suitable cooking times were determined for each—these ranged from 6 to 10 min. in steam at 212-214°F. The cooked flakes were then dehydrated by heated air in cross-flow cabinets in the usual manner.[1, 2]

Carrot may be cited as an example of the products. When placed in gently boiling water and simmered, the thinnest flakes reconstituted to a satisfactory texture in approximately 5 min., those 3/32 in. thick in 8 min., and those 1/8 in. thick in 12 min. (Fig. 1). Simmering was not essential; if boiling water was poured on the flakes measuring 1/16 × 5/16 × 3/8 in., and allowed to stand for 5 min., reconstitution was adequate and the product was quite edible after the surplus water had been drained off.

A mixture of the root vegetables mentioned above, cut 1/16 in. thick, along with fragments of dehydrated cabbage, leek and onions, made an attractive addition to clear soups, and required simmering with the stock for only 5 min. to appear perfectly reconstituted and develop satisfactory texture.

* Ministry of Agriculture, Fisheries and Food Experimental Factory, Aberdeen.

Vacuum contact-plate drying

Puffing technique. The vacuum contact plate system has previously been described.[3] By appropriate manipulation of the temperature and pressure in the system, steam channels can be induced within the portions of vegetable,[4] and dehydrated material of this type will absorb water more rapidly than the corresponding hot-air dried vegetable. When precooked vegetables, cut in the form of dice 3/16 × 5/16 × 3/8 in. or 5/16 × 5/16 × 3/8 in. were dehydrated in this manner, the products could be prepared for eating relatively quickly, but reconstitution was rather irregular; in carrot, for example, the majority of the pieces were fully reconstituted after gentle boiling for 15-20 minutes, but a few remained shrunken and hard even after 30 min. cooking. Carrot dice of similar dimensions, which had been subjected to the normal scalding procedure (3 min.) instead of 10-15 min. cooking before dehydration, required 25-30 min. cooking for adequate reconstitution. Air-dried carrot dice required 2 hr. soaking followed by 20-30 min. cooking. Precooking combined with the vacuum contact plate puffing technique therefore gave some degree of success but was not wholly satisfactory.

Accelerated freeze drying. Recent studies on the dehydration of fish and meat have shown that a period of freeze drying, followed by the more normal vacuum contact-plate technique, yields products of finely porous texture which absorb water almost instantly.[4, 5]

Carrot, swede, and turnip dice 3/8 × 5/16 × 3/8 in., precooked in steam for 10 min. and dehydrated in this way, can be prepared for eating by the addition of boiling water, standing for 2-3 min. and draining. The main fault of the product is that the texture is too soft and watery. If scalding for 3 min. before dehydration is substituted for the 10 min. precook, the product requires 5 min. gentle boiling, but still has a soft and watery texture. This latter product, however, appears to be

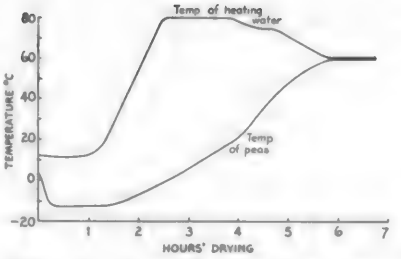

Fig. 2. Accelerated freeze-drying of peas: temperature of heating water and of peas. (Pressure in the cabinet was reduced to 3 mm. Hg. within 5 min. and subsequently fell steadily during the run to 0.2 mm. Hg.)

quite satisfactory when simmered in soup, and offers an alternative to the flakes described under hot-air drying above, while possessing the advantage of larger size of portion.

Peas, broad beans, and stringless green beans have been dehydrated by a similar process, and preliminary results have been very encouraging. The technique, as applied to peas, was as follows: marrowfat peas of green varieties, taken rather before the optimum canning stage, were cooked in steam for 8-10 min. and loaded on to trays of the large-scale vacuum contact-plate cabinet at approximately 80 lb. per tray (2½ lb./sq. ft.). For the first 1½-2 hr. the heating plates were kept apart, no heat was applied to the circulating water, and as high a vacuum as possible (approx. 1·5 mm. Hg.) was drawn in the cabinet. During this period some 35-40% of the water initially present was removed from the peas by true freeze-drying. At the end of the

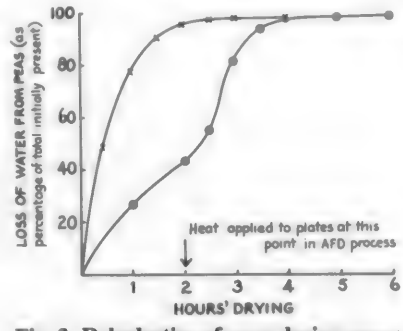
LOSS OF WATER FROM PEAS (as percentage of total initially present)
Heat applied to plates at this point in AFD process
HOURS' DRYING

Fig. 3. Dehydration of peas: drying curves for normal VCD process (x——x) and for accelerated freeze drying (o——o).

2 hr. period the heating plates were brought together sufficiently to make firm thermal contact with the peas, and the temperature of the circulating water was raised to 80°C. From this stage onwards drying followed the normal vacuum contact-plate procedure (Fig. 2). The introduction of the freezing stage added relatively little to the total drying time, which was 7-8 hr. Drying curves for the accelerated freeze-drying process and the normal vacuum contact-plate process for peas are shown in Fig. 3. Water absorption by the product was rapid, full reconstitution taking place within two to five minutes when the dehydrated peas were placed in boiling water and left to soak. The best reconstitution procedure seemed to vary with the extent of cooking given to the peas before dehydration; in some cases 2-3 min. gentle boiling was required to soften the peas after the reconstitution period of 2-5 min., in others no boiling was required.

No fully satisfactory method of preparing precooked potatoes in any form other than mashed potato has yet been found. Air dried flakes, vacuum contact-plate puffed dice or accelerated freeze-dried dice and slices have all tended to disintegrate on reconstitution. Using calcium chloride in quantities giving up to 1,000 p.p.m. in the dehydrated product has given only partial protection against disintegration. The accelerated freeze drying technique has, however, been successfully applied to scalded (not fully cooked) potato chips, ½ × ½ in. cross section; the products require 10-15 min. soaking in hot water before frying in deep fat at about 410°F.

CONCLUSION

Simple hot air dehydration of steam-cooked flakes of many root vegetables gives products which, provided they are of certain defined sizes, are suitable for inclusion in dried soups and for direct eating after 5 to 10 min. gentle boiling. The accelerated freeze-drying process enables larger por-

(*Concluded opposite*)

Recent Studies on Dehydration

Freeze-drying Fruit

THE production of acceptable samples of dried fruit by the freeze-drying technique has been the subject of considerable investigation. One of the difficulties encountered in this process has been the slow rate of drying of all but the smallest pieces of fruit. When halved peaches are dried, the time necessary to reach a water content of below 5% is 24 to 30 hr. under normal conditions. In a recent investigation,* it has been found that dielectric heating holds some promise of a very great reduction in this drying time.

Halved, pitted, lye-peeled peaches were freeze-dried under four different conditions of heating. Measurements of the rate of diffusion of water vapour through the drying mass showed that this was extremely high. The rate of heat transfer was found to be very low, however, and this is clearly the limiting factor. A drying technique based on the vacuum contact plate method was found to give slightly better results, and infra red heating also gave some reduction in drying times. With dielectric heating, however, the drying time could be reduced by as much as 90%. The dielectric constant of water in the 2,400 megacycle range is high in comparison with that of most of the cellulosic materials found in the fruit, and though this difference is less in the frozen state, it still permits the selective heating of unvaporised water without substantial heating of the dried product.

The process still presents some difficulties, but these appear to be being overcome. For instance, it was found that during the drying process the decrease in the load caused by evaporation of water from the sample caused an ionisation of the residual gases in the vacuum chamber. This resulted in point-ionisation on the surface of the fruit, with resultant burning. It was found that this could be prevented by allowing the pressure in the chamber to rise to above 1 to 3 mm. of mercury, but this caused the fruit to melt and collapse. A better method was to reduce the field strength applied to the sample as it became drier. It was found that a progressive decrease was necessary as the moisture content approached 20%. If a pressure of below 0·05 mm. Hg. could be maintained, quite high field strengths could be maintained without ionisation, but the difficulties of working at such low pressures are formidable.

* S. Jackson, S. L. Rickter, and C. O. Chichester. *Food Technol.*, 1957, **11**, 468.

Dried Fish Fillets

DURING the war years several types of acceptable dehydrated fish product were developed. All these were made from minced fish, however, and could therefore be used only in compounded dishes such as fish cakes. Experiments have been in progress for some time at the Torry Research Station of the D.S.I.R. to find a successful method of dehydrating whole fish fillets, and some results have now been published.*

It has been found that cod fillets dehydrated in a warm air current undergo gross changes in microscopic structure, sections of the reconstituted product showing a coherent, compact structure with few interfibrillar spaces. After 125 min. soaking these samples had taken up less than one quarter of their original moisture. Vacuum contact dried samples showed areas of fused muscle fibres, separated by many large spaces. Water uptake by these samples was almost 100% of the original water content of the tissue after 125 min. The freeze-dried samples retained the typical spindle-shaped spaces induced by the formation of ice crystals, even after reconstitution. Surprisingly, water uptake by these samples was not so rapid as with these which were dried by the vacuum contact plate process. With the freeze-dried samples, and with the best of V.C.P. dried samples, the initial water uptake during reconstitution was extremely rapid. If samples which were very rapidly frozen before drying were cut through after 2 hr. soaking, however, they were found to be completely dry inside. Apparently the entrance of the water through the very small pores of fish treated in this way was slow enough for the plumping-up of the outer layers seriously to impede further water penetration.

In all samples examined the drying process seemed to be associated with a certain degree of irreversible hardening of the protein, and attempts were made to discover the cause of this. The possibility of cross-linkages being formed was extensively investigated. Conclusions could not be drawn about the contribution of salt linkages to this toughening, though their possible importance was realised. Results indicated that few if any acid-base linkages were formed, but the possibility of amino-carbonyl linkages was not ruled out. The possibility was also considered of sulphide linkages, but no conclusive evidence was obtained.

* J. J. Connel, *J. Sci. Food Agric.*, 1957, **8**, 526.

Quick-Cooking Dehydrated Vegetables

(*From opposite page*)

tions of root vegetable to be prepared; these are not at the present stage of development satisfactory for direct eating, but are satisfactory in soups. Cooked peas, broad beans and green beans dried by the accelerated freeze-drying technique yield a most promising product.

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Increasing Dehydration Efficiency

By Leo Walter A.M.I.Mech.E.

It is impossible to operate dehydration equipment satisfactorily unless the significance of the main variable factors is clearly understood. In the following article, these factors are discussed, and figures are given to enable the plant engineer to assess the efficiency of his equipment.

IF air drying equipment is to work efficiently and economically, it is essential that the plant engineer should be fully conversant with its basic properties. It is therefore advisable for him to carry out a thorough examination of the equipment, with a view to increasing its productivity and thermal efficiency, and ensuring uniformity of the end product.

In performing his examination, the plant engineer should observe the following points:

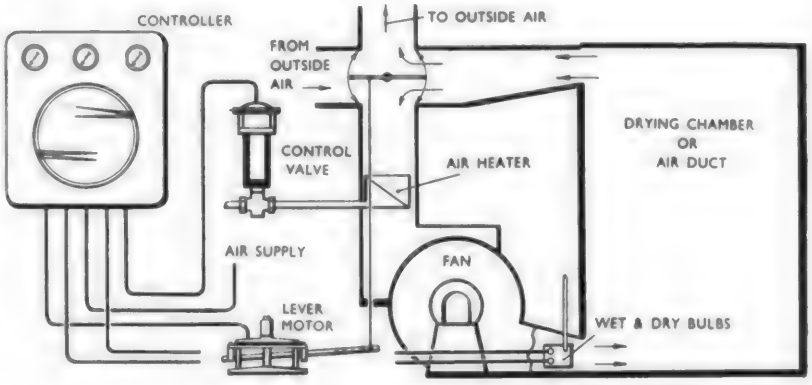
(1) In the first instance, a carefully worked out general survey should be made of all drying installations.

(2) Results obtained from measurements of the process factors should be analysed, using basic data for warm air and for contact drying.

(3) Instruments should be installed for obtaining precise data on temperature, humidity, speed, etc., in order that the efficiency of drying can be accurately assessed.

(4) It is not good enough to base a survey on guesswork alone, *i.e.* to be satisfied that output "seems satisfactory." In many instances it is possible that consumption of heat and power by the dryers is much too high in practical operation. The same output and quality of drying could be achieved with a reduced demand for fuel and electric power by increasing thermal efficiency.

(5) Where results of measurement show that a reconstruction is advisable, a generous allocation of expenditure for this purpose will be a paying proposition. A well-planned reconstruction of inefficient drying plant produces rewards in the form of better quality goods or increased production. Uniform and gentle drying may in the end product a more profitable product.



(Courtesy Negretti and Zambra, Ltd.)

Control scheme for combined temperature and humidity control.

(6) When a reconstructed dryer is operating at optimum efficiency it is highly desirable to use automatic control methods to standardise results by cutting out human errors.

(7) Should problems arise during investigations which are too difficult to be surmounted by the plant engineer carrying out the survey, it is advisable to secure the assistance of a specialised consultant.

For warm air drying the following factors have to be considered: (1) critical temperature of the material to be dried; (2) the time allowed for producing the required dryness; (3) moisture content of ingoing and of outgoing material; (4) output from the drying plant and drying cost per unit weight of material at the desired moisture content of the end product.

In general, the factors which influence dryer performance are: temperature, humidity, speed of air movement, and, for continuous drying, rate of movement of material. Hot-air drying is evaporation of moisture located on the surface between the fibres of a substance, and physically or chemically affixed to the smallest particles, and the rate of evaporation depends on heat input.

In any type of dryer, whether batch or continuous, the quality of drying depends on balancing heat input and rate of evaporation at any particular moment. The means of influencing rate of drying whether by hand or automatic control are:

(1) Change of temperature.

(2) Change of humidity of air.

(3) Change of velocity and/or direction of air, relative to the material.

(4) Change of air volume.

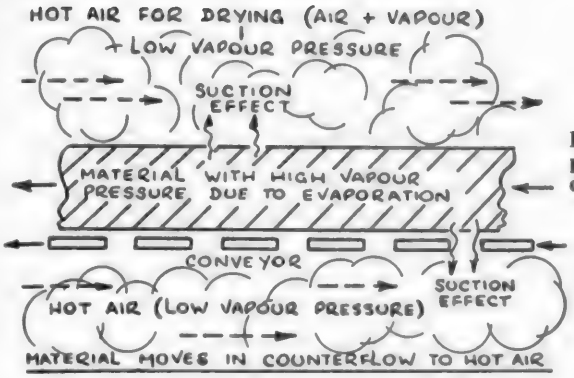
(5) Change of conveyor speed or of speed of material through a continuous dryer.

(6) Change of moisture content of material when entering the dryer.

Each of the above factors can be controlled to achieve the correct rate of drying and the desired final moisture content.

Comparing thermal efficiency

The usual criterion of thermal dryer efficiency is the term "lb. of steam per lb. of moisture evaporated"; this is not fully correct, because it does not take into account either steam pressure or


HOT AIR FOR DRYING (AIR + VAPOUR)
LOW VAPOUR PRESSURE
SUCTION EFFECT
MATERIAL WITH HIGH VAPOUR PRESSURE DUE TO EVAPORATION
CONVEYOR
SUCTION EFFECT
HOT AIR (LOW VAPOUR PRESSURE)
MATERIAL MOVES IN COUNTERFLOW TO HOT AIR

Development of vapour pressure within material during passage through a hot-air drier.

quality of fuel from which steam has been generated. The better term would, therefore, be "B. Th.U. per lb. of moisture evaporated."

Two ways are open for a works engineer to arrive at reliable steam consumption figures: by measurement of steam or condensate from heating surfaces or by simple calculation. In the measurement of condensate, flash steam has to be taken into account, *i.e.* the weight of evaporated condensate which forms when "superheated" water is released from a condensate line to the atmosphere, the weight of which has to be added to the weight of liquid condensate.

It is not the total steam consumption of two identical machines which indicates thermal efficiency, but the amount of moisture evaporated per lb. of steam of the same pressure and dryness fraction. For example, where the moisture in the material entering and emerging from the dryer, the weight of dried material per hour, and the steam consumption in lb. per hour are known, then the weight (W) of bone-dry material obtained per hour is:

$$W = \frac{100 - a}{100} \times d$$

where a = % moisture after drying, and d = wt. of dried material (lb./hr.).

Then, lb. of moisture evaporated per hr. (M) is:

$$M = (\frac{100 - b}{b} \times W) - (d - W)$$

where b = % moisture before drying.

(Courtesy L. A. Mitchell, Ltd.)

Falling-tray band-type drier for almonds and other fruits.

The weight of steam used, in lb. (S), per lb. of moisture evaporated can then be calculated, thus:

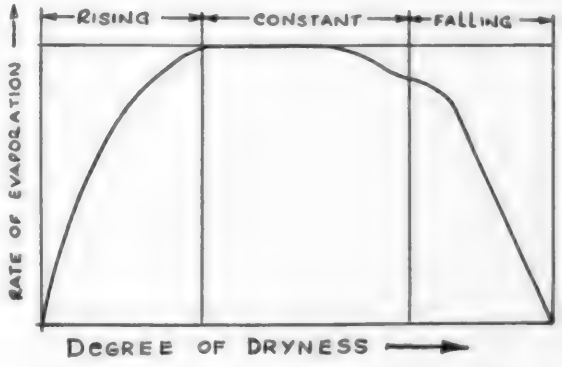
$$S = \frac{\text{steam consumption, lb./hr.}}{M}$$

How to introduce improvements

To improve the efficiency of hot-air dryers, all external surfaces should be insulated to prevent heat losses. The temperature and humidity of air and also air velocity should be measured at different points in the machine. Faults may become apparent in heat distribution, in the humidity content of exhaust air (which may be too low), or as a "dead" corner within a dryer. Utmost cleanliness of the outer and inner surfaces of heating coils must be secured, and efficient removal of condensate and air should be carried out. Tests will reveal the best applicable air volume and speed of circulating fans.

Sometimes changes in the speed of the fans might not cure the trouble, and a complete change of the size of the fan may be advisable. Where high air temperature and low humidity of exhaust air are known to be present, the adoption of air recirculation is indicated. Automatic temperature and humidity control should remove human errors.

The heat required for the evaporation of moisture from the goods (called the effective heat) may range from 40 to 70% of the total heat input. The sensible heat util-



Changes in rate of evaporation as drying proceeds.

ised for warming up the goods may range from as little as 3 to 50% of the total heat input.

The amount of heat required for warming up a certain weight of air is:

$$H = W(t_2 - t_1) \times S.$$

In this formula, "H" is expressed in B.Th.U., "S" is the specific heat of air in B.Th.U./cu. ft./°F. (as a rough average 0·24); t_2 is outlet air temperature, t_1 is inlet air temperature in the heater in °F.

In order to transform weight of air into the air volume at a certain temperature, the following formula can be used:

$$\text{Weight of 1 cu. ft. in lb.} = \frac{\text{°F. abs.}}{40}$$

$$\text{Or vol. cu. ft. at °F.} = \frac{\text{Weight} \times \text{°F. abs.}}{40.}$$

To obtain a rough estimate of the air volume required for theoretical evaporation of a given quantity of moisture, inlet temperature, humidity and corresponding outlet figures have to be known or assumed. Under average conditions, fresh inlet air can be assumed to be at 60°F., and about 40% relative humidity. The calculation for hot-air drying is then based on the amount of moisture to be evaporated by correct rate of heat input, and to be carried away by the right amount of air.

Calculating the heating surface

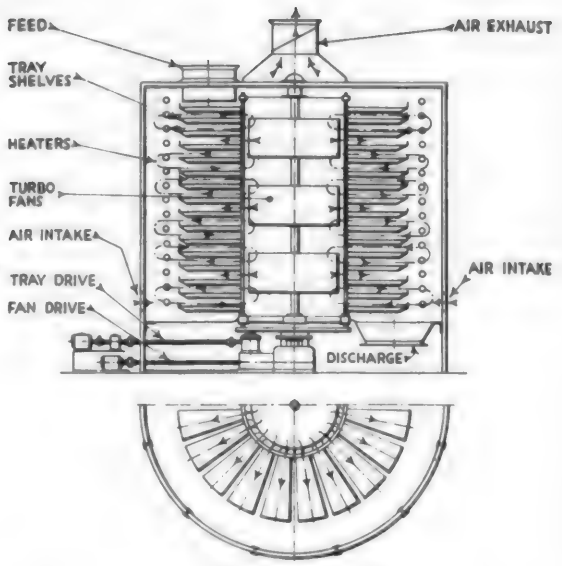
Assuming that the amount of heat required is known, and a steam pressure and temperature are chosen which provide a temperature differential between drying temperature and steam temperature, the heating surface can be calculated. This will depend on air quantity and velocity, and on heat transfer through the heating coil. The coefficients for heat transfer from steam to air are given for each type, size and quantity of pipe. For example, 3 B.Th.U. per sq. ft. coil surface per °F. temperature difference per hour may be assumed for very low air velocity in a drying-room.

The overall thermal efficiency of a hot-air drying plant based on fuel consumption, can be expressed as

$$E = \frac{\text{lb. evaporation} \times \text{latent heat}}{\text{lb. of fuel} \times \text{calorific value,}}$$

which is the ratio of useful heat input to heat requirement.

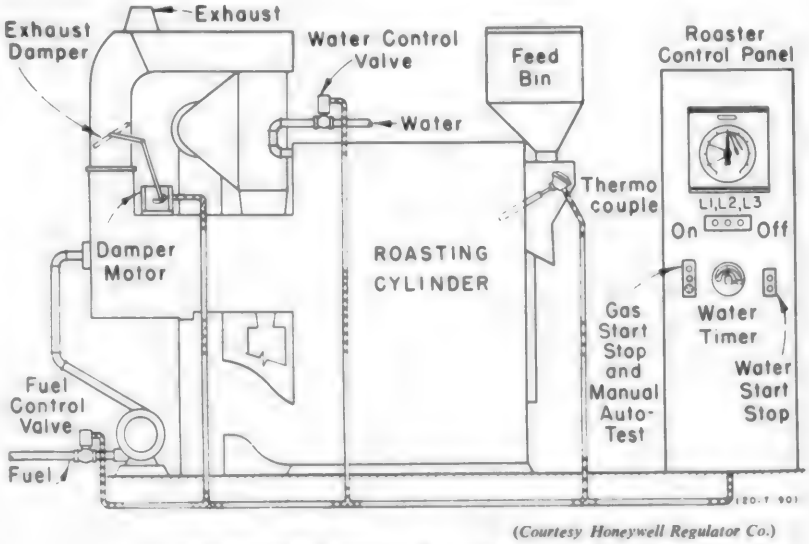
The following figures are given for rough estimates: air temperature will drop approximately 8·5°F. per grain of water evaporated per cu. ft. of air (measured at 70°F.). Measured at any temperature, the temperature drop will be about 0·62°F. per lb. of air per grain of water evaporated. In one passage air will generally absorb from 2 grains to 5 grains moisture per cu. ft. For very rough estimates of steam consumption, 2½ to 3 lb. of steam per lb. of evaporated moisture can generally be assumed.



Continuous tray drier for vegetables and fruit.

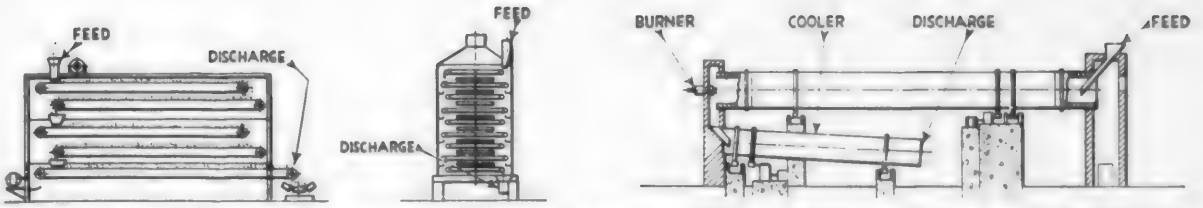
Progress in drier design

Generally speaking, great progress has been made in the design of hot-air and contact dryers during recent years. Nevertheless there are still many of the older types in use, most of which seem to be ripe for the scrap heap, mainly because they waste heat and do not produce goods of uniform quality. Home-made dry-



(Courtesy Honeywell Regulator Co.)

Control system for automatic coffee-roasting cylinder.



Band-conveyor driers. *Left:* **Horizontal multiple band.** *Centre:* **Vertical band.** *Right:* **Rotary drier with coolers, direct fired with oil or gas.**

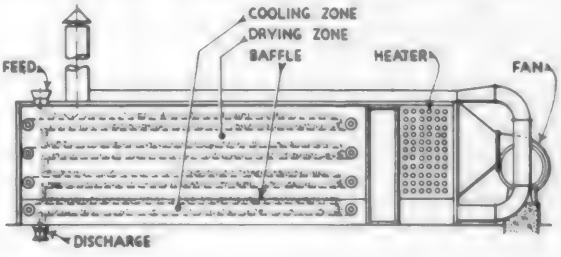
ing rooms or hot-air dryers are seldom efficient, as they rarely make use of those features which are incorporated by the designers of specialised plant as a matter of course.

Modern types of spray dryers work very efficiently, as great progress has been made in the design of reliable atomisers. Older types, however, lend themselves to reconstruction of the atomising unit, of filters, and of air heaters. They are also sometimes inadequately instrumented, and modern temperature, humidity and pressure recorders can be used with advantage. Thermal efficiency of spray dryers is less important than overall efficiency, but can be assessed more easily. Long observation and great experience are required, together with repeated tests, to obtain optimum output from a spray dryer at minimum cost. Sometimes an adjustment of the atomising unit will produce a different size of globule with consequent improved operation. Provided that the design of the atomising unit is efficient in preventing clogging or uneven atomisation, reliable operation can be expected. Where the high-pressure jet system causes the need for frequent nozzle cleaning with loss of production time, reconstruction and use of a revolving disc unit may improve matters; or it may be advantageous to use a nest of nozzles applying compressed air. Such air must, however, be free from oil as well as mechanical and other impurities.

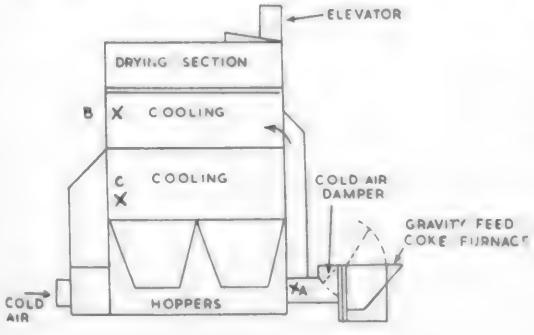
In pneumatic drying, care must be taken to ensure that the wet material is properly entrained in the hot gas or air stream, and frequent sampling is highly advisable. Measurement of air velocities during the various phases of drying will help considerably to maintain the dryer performance or to improve it, and easily cleanable pilot-tube flow meters can be used to watch the flow volume.

Excessive deposits in the cyclones indicate that the cyclone design is not up to date, or that cyclone surfaces have become rough. The question of air leakage is most important in pneumatic drying, but occasional tests with the soap-solution and air-bubble method will soon disclose escaping air.

Fan and motor maintenance is another important point to be watched. In some plants the means for adjusting gas velocity in relation to material characteristics are inadequate for operation with different materials. Redesign of dampers, etc., may improve matters, as may the use of an infinitely variable geared motor drive. Where frequent scorching occurs, the wet particles may be varying too much in moisture, content, and in shape; in such instances, the preparation before feeding requires greater care.



Falling-tray band-conveyor drier.



Temperature control of a direct-fired grain drier.

Conclusion

What must be realised by each user of a dryer is that no universal dryer exists which could handle the great diversity of food products to be dried. Great care has, therefore, to be exercised when using a drying installation for a different material than that for which it has been designed.

The writer has had repeated experience with dryers which have been bought as second-hand machinery, and have been installed to deal with a material completely different from that for which they had been originally intended.

It is here—where fuel, heat power and labour can be wasted, and where overall dryer efficiency is very low—that replacement by modern drying plants, designed for the actual working conditions, will be a sound capital investment.

EVAPORATION AND DEHYDRATION EQUIPMENT

THE requirements for evaporating plant vary considerably according to the nature of the material being processed, the degree of dryness required, the rate of production, and various economic considerations. The manufacturers of evaporating equipment produce a wide range of models suitable for particular processes, and advise on the right selection.

The usual type of evaporator is heated by steam, with tubular heating surfaces. These may be disposed horizontally, or vertically as in the standard calandria type.

Horizontal tubes

A popular type is the Kestner horizontal evaporator, made by Kestner Evaporator and Engineering Co., Ltd. This is a continuous film evaporator, with the advantage of short contact time. It is widely used at normal pressure for a wide range of products. In addition to the short contact time and avoidance of overheating, it has the advantages of occupying little space, and being simple to install, operate and maintain. These horizontal evaporators normally work without vacuum, but can be modified for vacuum operation when low evaporating temperatures are essential.

Horizontal type evaporators are also supplied by Blaw Knox, Ltd.

Above: **A fully instrumented pasteurisation and evaporation layout by Silkeborg. Individual units and complete plants can be supplied for concentrating dairy products and other foods.**

Vertical calandria type

An example of this type, with an external calandria, is the Apex model 66, made by Apex Construction, Ltd. This provides efficient evaporation due to the high speed of circulation of the liquor, and it also has the advantage of operating successfully on foaming liquids.

Contact between the liquor and the heating surface is short, and this model can therefore be used for heat-sensitive materials. A surface condenser and receiver in stainless steel can be fitted, the latter made in two parts to permit emptying without interrupting the process.

Another example of the calandria type evaporator is made by Blairs, Ltd., and is used, for example, for the concentration of malt extract. The outlet of these models is usually baffled to eliminate liquor entrainment, and recently wire mesh "demisters" have been installed in some plants for the same purpose. The operation of this type of single effect evaporator is comparatively straightforward. The liquor is fed in to a predetermined level, vacuum is applied and steam admitted to the calandria. Once the

condenser water is set to the correct rate no further adjustment should be necessary. As in the case of other evaporators, the chief maintenance is in keeping the tubes free from scale by wire brushing or rodding.

Kestner horizontal evaporator.

Multiplication of effects

A considerable saving of steam can be achieved by the use of multiple effect evaporators in place of single units. In these, the heat content of the vapour produced at each stage of evaporation is used to produce evaporation in the subsequent stage, which operates at a higher vacuum and therefore at a lower temperature. A double effect evaporator of this type is made by Bennett, Sons and Shears, Ltd. Designed for use in the dairy industry, this unit is capable of handling 1,350 gal. of full cream milk per hr. when concentrating to an output of 480 gal. per hr. It is constructed entirely of stainless steel, polished internally, and all welds are ground smooth. To avoid entrainment losses, the calandria are placed in a sloping position, and a centrifugal-type side separator is fitted. When handling whole milk, the evaporator operates at 140 to 150°F. in the first stage and 115 to 120°F. in the second. Thermo-compressors may be fitted if desired.

Single and double effect evaporators designed essentially for milk products are also marketed by Hiron and Rempler, Ltd. Their *Silkeborg* evaporators are designed to give concentrates with up to 50% milk solids with steam consumptions as low as 0·36 kg. steam per 1 kg. evaporated water. Quick circulation and low temperature differentials provide for gentle heating of the product. Cleaning is said to be possible entirely by circulation of detergents, but the interior is easily accessible for inspection purposes. A wide range of sizes is available.

Evaporators for milk and milk products are also made by the A.P.V. Co., Ltd. Once again, double effect units are constructed where high capacities are desired, and steam consumption becomes an important factor. Evaporators of the required capacity—which may cover evaporation rates of 2,000 to 18,000 lb. per hr.—are assembled from combinations of calandrias and separators selected from a standard range.

A very wide range of evaporators for all types of food products is made by Korting Maschinen-u Apparatebau-AG., who are associated with Stanfield and Carver, Ltd. Single stage units for either batch or continuous operation are provided where minimum initial cost and simplicity of operation are over-riding considerations, but multi-stage evaporators can be provided for larger installations. Evaporators with rotating agitators are also built.

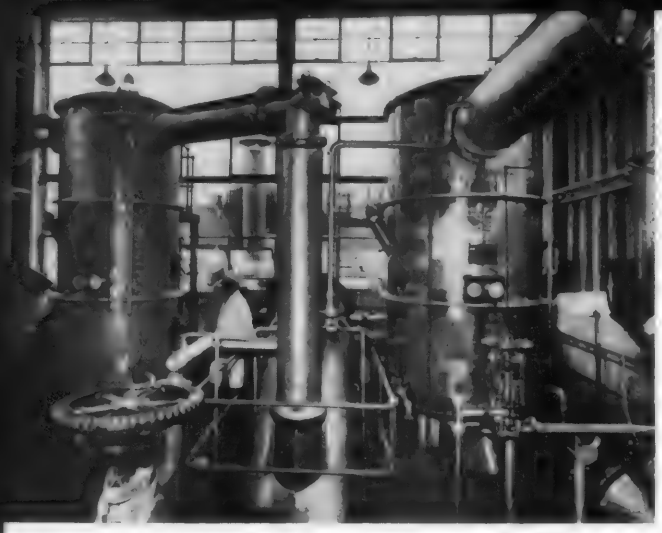
Thermo-compression

A further saving in steam consumption may often be made by use of the thermo-compression system, which has been described in greater detail in a previous article. In all the evaporators described above, thermo-compressors are either fitted as standard practice or are available as optional extras. Where steam-jet compressors are used, as in the A.P.V. system, steam should be available at a minimum of 100 p.s.i.

Film evaporators

In the evaporators described above, the liquid to be concentrated is circulated through the calandria tubes until the desired degree of concentration has been achieved. This means that the liquid comes into contact with the heating surfaces several times, and may be held at an elevated temperature for some time. To avoid the losses in flavour quality which this may entail, evaporators have now been designed in which the liquid passes only once over the heating surfaces.

These evaporators usually work on either a climbing or a falling film principle, although film evaporators are not confined to single-pass operations. Blairs, Ltd., produce a multi-effect evaporator of the climbing and film type. Each effect comprises multiple calandrias with side separators attached at the top. These work on a centrifugal principle, the liquors



View showing both effects of the double-effect evaporator made by Bennett, Sons and Shears, Ltd.

and vapours emerging from the calandria being directed tangentially against the wall of the separator. A vortex is thereby formed, and this greatly increases the efficiency of separation of the liquid and vapour phases. The liquid passes to the calandria of the next stage, where the vapours are used, after recompression, to effect further evaporation. Although a single passage of the liquid through the calandria may be sufficient to effect the desired degree of concentration, a certain amount of recirculation may be carried out if necessary. This does not alter the film principle on which the evaporator works, though it does, of course, increase the length of time for which the liquid is kept hot.

A falling film evaporator is made by Apex Construction, Ltd. This has been designed to overcome the difficulties which sometimes arise with heat-sensitive liquids in climbing-film evaporators. If, in the latter type of evaporator, the film becomes too viscous during the course of evaporation, it may fail to climb the calandria tubes, with the result that passage of liquid through the evaporator ceases and scorching of the product may occur. In the Apex evaporator, the falling film is obtained by means of a circulating pump, so that it is as positive as a forced circulation unit. The circulated liquor is fed to the calandria by means of special distributors inserted in each tube, so that it is forced to flow in a thin film down the tube surfaces. The entrainment separator is situated at the bottom of the calandria.

A plate evaporator

A new type of evaporator, using plate-type rather than tubular heat-exchangers, has recently been developed by the A.P.V. Co., Ltd. The units, which can be used in single or multiple effect, look much like large plate heat exchangers such as are used for normal pasteurisation processes, but the construction of the plates is very different. The evaporator is based on a combination of the climbing and falling film principles, and its single-pass operation is said to be very suitable for concentrating heat-sensitive materials. The plates are gasketted and held together in a frame, so that they can be separated for cleaning purposes. It is also possible to vary the number of plates to suit the rate of evaporation required. The evaporator has just completed a year's factory trials, during which the following degrees of evaporation were achieved: skim milk, feed 9% T.S., product 46% T.S.; whey, feed 6% T.S., product 37% T.S.; apple juice T.S. 10%, product 65% T.S.; apple pectin T.S. 1%, product 7% T.S. These product strengths were production requirements, and do not represent the maximum attainable in the evaporator. The tests are to be continued in Jamaica, where the performance of the evaporator on citrus juices will be observed.

A "heat-pump" evaporator

An evaporator designed for concentrating heat-sensitive liquids at low temperatures without the use of steam has been developed by the Kestner Evaporator and Engineering Co., Ltd. Known as the *Coolcentrator*, it works on the heat-pump principle, using ammonia gas instead of steam as the heating medium.

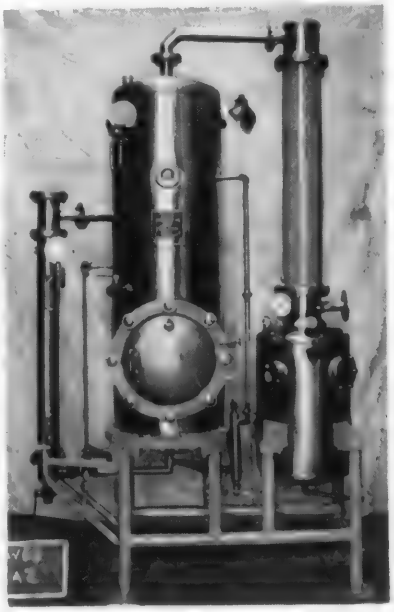
The *Coolcentrator* was described and illustrated in the October issue of FOOD MANUFACTURE.

Vacuum pans

For some products, such as tomato purée, concentration is accompanied by such a large increase in viscosity that evaporators of the calandria type are not practicable. In the preparation of these products it is therefore customary to evaporate under vacuum in a vessel which can be more fully opened. Plant of this type is made by Brierley, Collier and Hartley, Ltd.

In the example illustrated on p. 507, a 50 gal. steam-jacketed vacuum pan is coupled to an open steam pan, the whole assembly being designed for the rapid production of strong sugar syrups such as are used in the syruping of citrus peels.

Vacuum pans for the evaporation of products with a high viscosity are also made by Hiron and Rempler, Ltd.



Apex external calandria type evaporator with surface condenser and receiver.

Driers

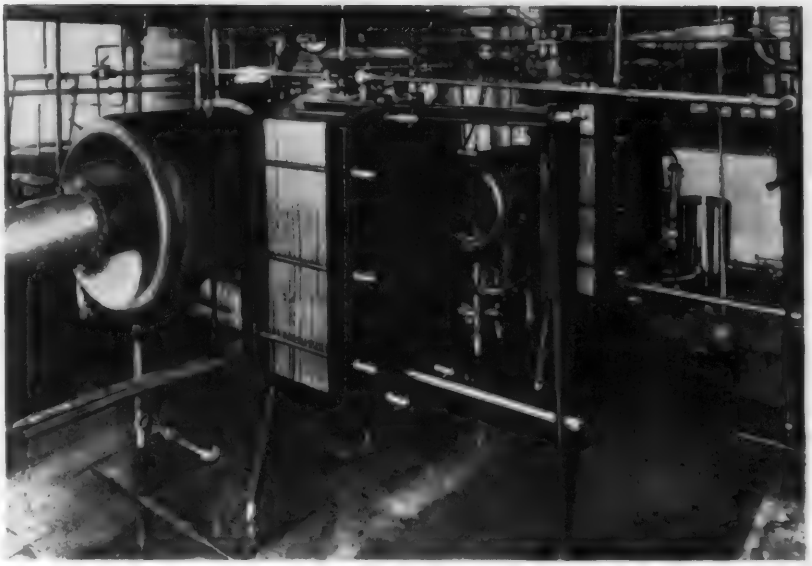
Where the whole of the liquid has to be removed from a foodstuff, leaving it in a powder form, quite different techniques have to be adopted. The two common methods are spray drying and roller drying. In the *Silkeborg* spray drier, marketed by Hiron and Rempler, Ltd., the liquid food is atomised in a hot-air chamber, where it meets a current of air heated to 200°C. or more. The water is rapidly flashed off, and the resultant powder falls to the bottom of the chamber. This has a slightly conical bottom, enabling the powder to be drawn from the chamber by means of a slowly rotating pneumatic device.

From the drying chamber the powder is carried to a battery of cyclone separators, where it is separated from the hot air. The lower part of the cyclone battery is equipped with rotary valves, from which the powder is emptied into an air duct, where it is cooled. Finally, a single cyclone separates the powder from the cooling air.

Roller driers by *Silkeborg* are also available. These include double drum driers for milk with a capacity of about 265 gal. per hr. of non-evaporated milk. By pre-evaporation of the milk, the capacity of the drier can be increased by up to 25%.

Driers for solid foods

When foods which are solid before drying have to be handled, further difficulties arise. It is not usually possible in this case to get such efficient heat exchange, as the material to be dried cannot be circulated but must lie stationary on trays or a conveyor. If the food is in powder form, however, it can be handled more like a liquid, and circulated against drying air. In the Kestner *Thermo Venturi* (T.V.) drier, which may be used for such products as wheat or corn starch, the product to be dried is fed into a vertical drying column of special shape. The material is introduced near the bottom of this column, whilst a stream of heated air of high velocity is pumped in just below it.



The new A.P.V. plate evaporator, which has been used successfully on milk products and is now being tested on citrus juices.

The air carries the powder to the top of the column, drying it in the process, and the air and powder are then separated in a cyclone separator.

It is claimed that the unit will handle quite moist material provided it is in a friable form and does not form a sticky paste. The drier can be operated from a control panel, on which are grouped the necessary temperature and pressure recorders. Fully-automatic control can also be fitted, and it is claimed that a high degree of consistency in product composition can be obtained.

The Kestner T.V. drier is illustrated on p. 507.

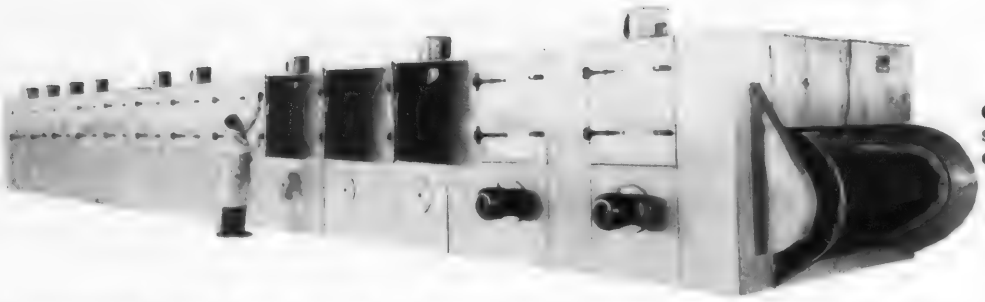
Drying coarser materials

With solid foods which are not in powder form, resort has to be made to other types of drying equipment. It is not usually possible to use high temperatures, and many products have a low bulk density, so that drying installations tend to be rather bulky for the throughput involved. For small quantities of material it is sufficient to install steam-heated hot air drying stoves, the material being dried on trays. Where larger throughputs are concerned, however, the handling problem can become acute, and a continuous drier is indicated.

As many products are in the form of small particles or pieces, one of the most efficient types of installation is the continuous through circulation drier, in which the material is loaded on to a perforated conveyor band and dried by circulation of warm air through the bed of material, the air temperature and humidity being controlled at optimum values. The drier is usually divided into a number of identical sections, each supplied with its own circulating fan, heater battery and control instruments.

Space saving in this type of drier is achieved by using two or more conveyor bands in one drying enclosure where conditions are favourable, the material being transferred from band to band and passing several times through the drier. A considerable variation in design is also possible with regard to the conveyor bands themselves, since these can be fabricated from wire mesh, wire mesh panels or articulated perforated metal slats to suit the duty, using galvanised mild steel, stainless steel or aluminium as necessary. The precise requirements of the drier with regard to product size and nature and susceptibility to contamination can thus be met from a range of standard designs.

Products successfully handled



Continuous band drier suitable for drying starch or vegetables, made by L. A. Mitchell, Ltd.

in continuous band driers include peas, diced vegetables, cereals, biscuits and edible gelatine. In many such cases the sectional construction of the drier is critical, as succeeding sections will operate under different conditions to achieve the best possible rate of drying without damage to the product.

L. A. Mitchell, Ltd., specialise in this type of drier, and a large installation made by them is illustrated. They also manufacture steam-heated rotary driers and ovens for tray drying.

Vacuum tray driers

In order to cut down the time and temperature of drying, vacuum may be applied during the process. A new series of vacuum shelf driers has been introduced by the F. J. Stokes Corp., of Philadelphia. The chamber of these driers is made entirely of welded steel, and all shelf and manifold connections are outside the chamber, thus avoiding the possibility of leaks developing within the chamber. The range includes units with shelf sizes from 24 × 24 in. up to 60 × 80 in. Standard size chambers are maintained in stock, and these can be fitted with any desired number of standard shelves to suit customers' requirements. Heating by hot water, steam or special heat-transfer fluids can be provided for.

Crop driers

A range of grain and crop drying equipment is made by Ransomes Sims and Jefferies, Ltd. These machines are based on a system of drying which consists of blowing low-temperature hot air through the mattress of grass or other green crop, or the bed of grain, as it passes on an endless conveyor through the separate temperature stages. In one of the larger capacity units, the body of the drier is divided into two separate air chambers. For grass drying, hot air is supplied to each chamber by a separate fan, whilst for grain drying one fan is controlled by dampers to deliver cold air only for cooling purposes. This unit has an output capacity of 4 cwt. per hr. when drying grass from 80% to 10% moisture content. When used for drying grain from 21% down to 16% moisture content, the unit has an output of 30 to 60 cwt. per hr., depending on the drying temperature used. A smaller drier is also made, which has an output on grass under similar conditions of 2 cwt. per hr., and on grain of 20 to 40 cwt. per hr. Ransomes also make a smaller grain drier, built on a vertical pattern, for farmers with a smaller acreage.

With all these driers, furnaces and other auxiliary equipment are provided. The furnaces are normally designed for oil firing, but with the larger units provision for solid fuels can also be made.

Radiant heat drying

The use of radiant heat equipment is becoming a familiar practice in the food industry.

For all practical purposes associated with the use of infra red equipment in industry, infra red can be defined as an electromagnetic radiation which, falling on a material substance causes its temperature to rise; no intervening medium is required to effect the heat transfer.

Infra red radiation is similar to light in that it may be absorbed, transmitted, reflected and refracted according to the wave band covered by the radiation and the material receiving it.

In an infra red oven, radiation is directed towards the object to be heated by means of suitably shaped reflectors made from a metal chosen for its powers to reflect radiation strongly within the wave band concerned. These reflectors also serve to re-direct the radiation reflected from the object. Infra red heating enables heat to

Metrovick radiant heat element.

be transferred directly from one body to another without the necessity for an intervening medium such as air.

The peak emission from a black body radiating at 750°C. very nearly coincides with the peak absorption wave length for water and therefore is much more suited to most drying processes than the infra red lamp, whose filament operates at 2,200°C. The *Metrovick* infra red projector, with which it is possible to build up a wide variety of drying equipments, utilises a tubular sheathed heating element running at this optimum temperature.

Standard projectors are available in three sizes, 18, 24 and 36 in. long, these sizes having been found by experience to be those most convenient for general applications and for building up into banks. In addition to these, which are normally available from stock, projectors can be supplied up to a length of 7 ft. 6 in. in increments of 6 in. Six elements can also be incorporated to give a higher intensity radiation.

Drying granular materials

When drying granular material it is often desirable to convey this on a vibrating conveyor in order to obtain penetration without caking of the surface and in such cases the narrow mouth projector is of particular use.

The drying of sugar, starches and farinaceous foods by the use of infra red projectors is often extended to include partial cooking and browning of such items as breakfast cereal and biscuits. Apart from the actual foodstuffs themselves, speedier packaging is facilitated by the use of infra red units for *Viskring* and *Viscap* sealing and label drying, an interesting feature being that the localisation of heat permits the drying of labels on tins of chocolate biscuits without deterioration of the contents.

In addition to radiant heaters, the same type of tubular sheathed element is utilised for building into evaporation plants, processing units and for immersion heaters.

Atomic Energy in Agriculture

At the International Conference on the Peaceful Uses of Atomic Energy, held in Geneva in 1955, a great deal of scientific data were presented on the uses of atomic energy in agriculture. This information has now been collected and collated in book form,* and published as the fourth volume in the Butterworth *Atoms for Peace* series, of which Mr. D. Wragge Morley is editor. The book is no mere re-hash of this data, however, for the author has treated his commission by the publishers carefully, and has produced a highly readable book.

The first chapter deals with the production of new plant forms by the use of radiations to induce mutations. Most of the work has been pioneered by the Swedes, who have applied the techniques to a large variety of food crops, including cereals, legumes, plums, apples, cherries, and other fruits. Some of the results have been highly gratifying, and the commonly-held belief that all mutations are harmful certainly does not apply, at least as far as harmful effects of foodstuffs on man are concerned.

The next two sections of the book are concerned with plant metabolism, both from the point of view of the mechanism of photosynthesis and the utilisation of trace elements. In this field a great number of older conceptions concerning the part played by various plant organs have had to be re-orientated. Then come two chapters dealing with the role of isotopes in the study of pests and forestry, and much advance has been possible in both fields by the use of the modern radiochemical techniques.

The final chapter offers perhaps the greatest interest and challenge to the food specialist, for this deals with the use of radiation for food preservation. Mr. Dick has taken care to point out some of the difficulties so frequently overlooked by the less cautious and more zealous writers. Satisfactory sterilisation of foodstuffs may be very different from complete sterilisation, for example, and the latter may necessitate such large radiation doses that damage to the products results. There is also raised the very important question of the induction of nuclear reactions, which could give rise to radioactivity in a great number of atomic species, some of them of comparatively long life. The highly energised nuclei might also be responsible for chemical changes which would cause nutritional and organoleptic deterioration.

While this book was meant obviously for the agriculturalist, there will be much in it to appeal to a wider circle of readers. It offers both interest and a challenge.

F. R. Paulsen.

* *Atomic Energy in Agriculture.* By W. E. Dick. Butterworth, 1957. Pp. 150. Illus. 15s. net.

New Trends in Can Making

A method for determining whether the inside or the outside of a can has the thicker coating was demonstrated recently during an Open Day at the British Iron and Steel Research Association's South Wales Laboratories. The method, which was developed by the association and which is being patented, is to dull one side by applying a thin electro-deposit of iron (about 0·25 micro inch thick) after tinning but before flow brightening. Thicker inside coatings are used to resist the corrosive action of acid fruits.

A technique for tinning the edges of lacquered steel for canmaking was also shown. Lacquered steel has had the disadvantages so far, that it presents no tinned surface for soldering, it cannot be used for all food packs, and the lacquer is easily damaged. However, it is now possible to tin the edges for soldering and to lacquer one side of a sheet and tin the other. B.I.S.R.A. has built an experimental line for lacquering steel strip, on which coatings of epoxy-resins up to 0·5 mil. thick can be applied and cured by heating. A coating as little as 0·15 mil. thick has been found to protect steel.

Advances in Food Technology

MEAT

Pre-Packaged Liver

Although pre-packaging is a desirable hygienic measure, it must not be assumed to be as effective as pasteurisation or sterilisation. In Germany, the practice of pre-packaging has now also been extended to offals, especially liver, where there is a particular risk of bacterial decomposition. The German Meat Research Institute at Kulmbach has carried out research on the keeping quality of frozen liver wrapped in cellulose film and *Cryovac* bags. With the latter, it was found that the liver surface, when immersed in hot water, assumed a greyish appearance, and that there was a substantial drip loss during storage so that the wrapping could not be regarded as suitable. The liver samples wrapped in cellulose film showed considerable organoleptic changes after two days of storage at a constant temperature of about 34°F. so that the goods were no longer saleable. Since the storage temperatures encountered in practice are generally higher, there is at present good reason to advise against the selling of pre-packaged liver or other offals.—F. Kelch and L. Leistner, *Die Fleischwirtschaft*, 1957, **9**, 334.

FISH

Pasteurisation and Storage Life of Salmon Roe

The effect of various degrees of pasteurisation upon chemical properties and microbiological structure of salmon roes in relation to length of preservation has been determined. Roes packed into glass containers (115 g.) under vacuum (450-500 mm.) were heated once at 60, 65 and 70°C. for 1, 2 and 3 hr. respectively, then at 75°C. for 30 min. and then three times at 60°C. for an hour; there was an interval of 24 hr. after the first two heatings. The best appeared to be heating at 65°C. for 1 hr. With this no disintegration of oils and albumens takes place, and *p*H in the roes does not change. Pasteurisation increases the preservation twofold without change of quality at −4°C. compared with unpasteurised roe in standard containers, and by 1½ compared with unpasteurised roe in glass containers. At 18°C. the increase in time is sixfold (from 15 to 90 days), regardless of how they are packed.—I. I. Lapshin, *Sbornik rabot Moskovsogo instituta nar. khozyaistva*, 1956, **8**, 148-159.

PINEAPPLES

New Source of Proteolytic Enzyme

The lower stem or "mother" stump of the pineapple plant, is being used by the Dole Hawaiian Pineapple Co. for making bromelain, a protein-digesting enzyme with promising applications as a meat tenderiser, in brewing and in chocolate manufacture.

The stumps are washed and crushed and the extracted juice is filtered. Bromelain is precipitated from the clarified juice by the addition of acetone and is then separated by centrifuges. After oven drying, the product, a very fine powder, is packed into polyethylene bags which are inserted into 50-lb. drums for shipment.

Bromelain is a mixture of enzymes, most of which are protein-digesting. The action of the enzymes increases with rise in temperature up to about 70°C., at which temperature they are destroyed. Bromelain is said to act faster than papain as a commercial meat tenderiser.

The application of bromelain as a flavour extender in such foods as chocolate, where protein capsules encase a large part of the flavour, is also envisaged.—*Chem. and Eng. News*, 1957, **35**, 38, 83.

DEHYDRATED FOODS

Browning Reaction in Reconstituted Dry Milk

Rapid chemical changes in freshly constituted dry milk are reported which may—if milk is considered as a representative sugar-protein food—be encountered in many other dehydrated foods.

Six samples of reconstituted non-fat dry milk were analysed for 5-hydroxymethylfurfural and for indophenol-reducing substances. The 5-hydroxymethylfurfural analyses did not measure free 5-hydroxymethylfurfural in the milks but rather the amount formed under standardised digestion conditions. The quantity of 5-hydroxymethylfurfural formed under these conditions is believed to be correlated with the intensity of Maillard-type browning reaction in the samples. The results of the indophenol titrations were expressed as molar concentration of diolreductone rather than as the conventional weight equivalent of ascorbic acid.

The results showed that some rapid chemical changes were definitely taking place in the three samples of freshly reconstituted instant milks. The changes in non-instant milks appeared to be less pronounced and more variable. Furfurals and reductones are well-known products of the browning reactions in foods containing sugar and protein and higher levels of 5-hydroxymethylfurfural and reductones in the instant milks as compared with their noninstant counterparts, indicate that the "instantising" process used on these milks caused browning-type reactions to take place.

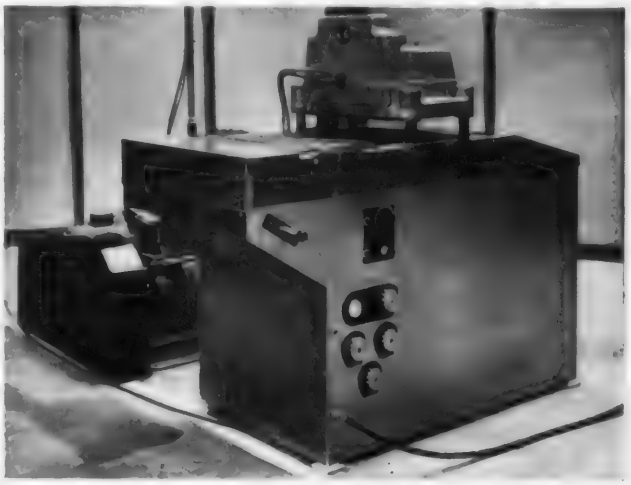
It appears that certain products of the browning reaction accumulate in dehydrated foods and may rapidly be converted to other products upon hydration.—M. Keeney and R. Bassette, *Science*, 1957, **126**, 3272, 511.

Machinery and Equipment

VACUUM PACKAGING

A hand-fed but otherwise fully automatic vacuum sealing machine for pouches of polythene and other heat-sealable films has been introduced by the Metal Box Co., Ltd. The machine incorporates an endless intake and discharge belt, a high-vacuum evacuating chamber, and thermostatically controlled sealing bars. An external vacuum pump is supplied which is selected according to the output required. To operate the machine, packs are placed by hand on the rubber belt, which carries them into the evacuation chamber. This then descends, and when vacuum has been drawn, the heat-sealing bars are brought down. After release of the sealing bars the chamber reverts to normal pressure and the sealed packs are discharged on to a sloping platform for gravity delivery.

The operating speed is 25 to 30 packs per min. for single packs, which may measure up to 13½ in. by 11 in. With packs which are small enough to be placed side by side on the belt, multiples of these speeds may be obtained. Gas flushing of the chamber may be carried out, but this reduces the speed of operation.



Metal Box No. 24 vacuum pouch-sealing machine, equipped with an 8 h.p. pump. Pump size is varied according to the load.

BUNG KEY

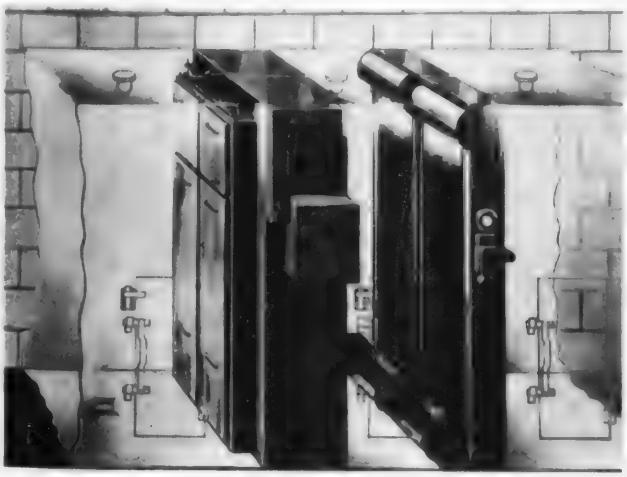
A compact tool which fits the usual size drum filler bungs and tap plugs has been added to the range of drum accessories made by Powell and Co. The key is made of steel and is assembled by means of a single "Mills" pin to make a rigid one-piece unit. The operator can exert maximum leverage without risk of injuring his knuckles or hands. There is no damage to bungs, washers or to the drum.

AIR FILTRATION UNIT

An air filtration unit based on the electrostatic precipitation of suspended particles has been introduced by Air Control Installations, Ltd. The unit comprises an ionising section, an agglomerating element, and a roll filter. In the first section, electrodes of tungsten wire are charged with a direct current of 12,000 v., so that a strong field is set up between the wires and parallel grounded struts. Particles of dust and smoke passing through this field intercept streams of ions passing from the wires to the struts, and acquire a surface charge of definite polarity.

In the next section of the unit, the air passes over closely spaced parallel metal plates alternatively charged and grounded to maintain a uniform electrostatic field. The charged dust particles are attracted to plates of opposite polarity and agglomerate. When the particle build-up becomes great enough, the accumulation is carried by the air stream to the filter.

The filter consists of a 65 ft. length of compressed bonded glass fibres, which is supplied in roll form. This is fitted in the same way as a camera film, and forms a moving curtain at the end of the unit. Movement of the curtain is controlled by an automatic timer switch, which introduces sufficient clean medium to maintain operating resistance at the required level. The filter is re-rolled at the bottom of the unit along with its dust load, and is removed intact for disposal.



A new air filtration unit produced by Air Control Installations, Ltd.

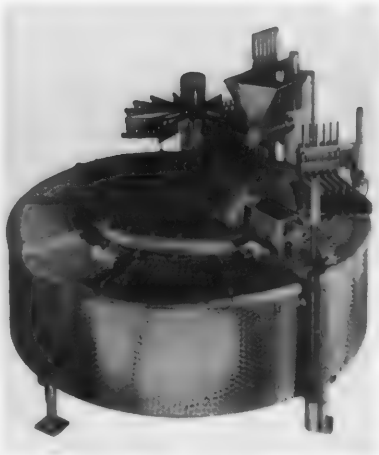
FOOD GRINDER

Foodtech, Ltd., can now offer a 9 h.p. model of the *super grinder* mainly for use by the smaller food manfacturer, hospitals, hotels and other catering establishments. At the other extreme of the range a new 75 h.p. model is also available.

The super grinder, developed by Mr. P. Helmut Hilgeland, managing director of Foodtech, is suitable for making pork sausages, luncheon sausages, frankfurters, liver sausages, meat and fish paste, confectionery, fruit juices, sauces, mayonnaise, diced vegetables, cream, etc.

It is claimed that the machine will cut any form of food ingredient in a dry, wet or frozen condition and every kind of meat.

All models can be supplied to customer's electricity requirements. The motor is protected by a remote control switch. Funnel and discharging mouth are made of heavy aluminium and fixed by quick release bolts. The cutting can be regulated.



"Rollo" automatic ice-cream-bar freezer.

ICE-CREAM-BAR FREEZER

The range of equipment for the ice cream industry manufactured by the A.P.V. Co. has been extended by the inclusion of the *Rollo* ice-cream-bar and water-ice freezer—a machine developed by the Hoyer Manufacturing Co., of Denmark, to meet the growing trend towards the production of frozen confections on wooden sticks.

The freezer is fully automatic and has a capacity of 6,000/12,000 bars an hr. according to the size of the product. Chocolate coated or multi-flavoured bars, in a wide variety of shapes, can also be produced.

The machine includes a low-cost freezing and thawing system requiring no external brine circuit, and a mould table consisting of small sections which can readily be lifted off for cleaning and sterilisation. Detachable nylon bristle frames, which enable sticks to be inserted while the mix or syrup is still liquid, eliminate the very careful timing of stick insertion which would otherwise be necessary.

A specially designed aluminium sterilising cabinet supplied with each machine accommodates a complete set of moulds and also serves as storage for these when the machine is not in use.

HYDRAULIC VALVES

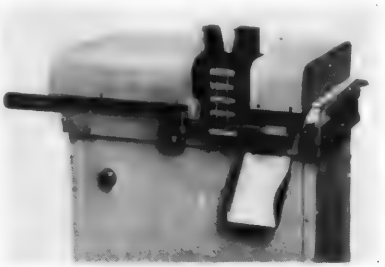
A range of hydraulic valves which can be operated by hand, foot, solenoid, air cylinder, air diaphragm or hydraulic cylinder and which may be easily converted from one mode of operation to another has been developed by George Ellison, Ltd.

No setting of the valves is required when they are being reassembled and arrangements can be made for manifold mounting. According to the makers they are suitable for standard pressures of up to 2 tons p.s.i., and the standard design allows for any number of ports up to 5.

PACKAGING MACHINERY

G. D. Peters and Co., Ltd., whose offices and factory are situated at Slough, interested themselves in packaging machinery immediately post-war and during the ensuing years have spent much of their energies in developing and improving packaging techniques. A wide range of packaging machinery is now manufactured including automatic and semi-automatic labelling machines, cartoning machines, lidding plants and many special purpose machines which are used in all branches of industry.

To meet increasing demands in this field, a new company has been formed, to be known as Packaging Machinery (Peters), Ltd., which is a wholly owned subsidiary and which will take over the whole of the parent company's packaging machinery interests. The new company will continue to have the full financial and technical support that it has received in the past, but being a separate entity it will be able to give the consumer its full attention.



Machine for coding tubes and other cylindrical containers.

Mr. W. J. Ellison, Mr. F. W. Denning, Mr. K. Barnard, and Mr. R. Martin, who have been responsible in the past for the sales of packaging machinery for G. D. Peters and Co., Ltd., will continue to serve their many friends in the industry under the new company.

AUTOMATIC END CODER

A machine for coding cylindrical objects such as aluminium tubes has been developed by Alite Machines, Ltd. The containers are fed into the magazine of the machine by hand or from a conveyor line at a rate of 60 per min. and they drop on to a locating Vee. A mandrel then enters the container, carrying it cross the machine and forcing its base against the coding type. The mandrel is spring-loaded to prevent damage to the base of the container by the type. The locating Vee prevents the container from returning on the mandrel, and it falls on to a conveyor or into a hopper.

Magazines, mandrels, etc., are interchangeable, and the basic unit may thus be used on containers from ¼ in. to 2 in. dia. and from 1¼ in. to 6 in. long. The unit can be supplied to operate from either 5 or 10 amp. supply, and may be moved about the factory at will.

ELECTRIC FORKLIFT TRUCK

The latest Ransomes Forklift Truck, the *NR.*15, follows the basic design of the Ransomes *FL.*10, and is capable carrying 1,500 lb. at 20 in. load centre or 1,600 lb. at 16 in. load centre. A large battery of 278 amp./hr. capacity is incorporated in this model to cater for the increased load capacity and the ballast weight fitted is stated to give the truck a very small turning radius. "One shot" lubrication is now standard and all the usual attachments are available.

Production of this model is due to commence early next year.

PEEL CUTTER

A rotary cutter for citrus fruit peel has been designed by Angelo Salvado, of Messina. Orange or similar peel is feed into a chute from which it drops on to two transporters which, without squeezing it, push it forward beneath a set of rotating blades which cut it longitudinally. Immediately afterwards the strips of peel pass beneath another set of revolving blades which cut them crosswise. The width of the cut is adjustable. The machine can deal with about 1½ tons of peel an hour.

Our Rome correspondent reports that the machine is driven by two electric motors, one of which (1½ h.p.) spins the cutting blades and the other (½ h.p.) drives the transporters. All the gear-wheels are enclosed in an oil-bath and automatic lubrication is provided for all the bearings. The blades and all the other parts coming in contact with peel are made of stainless steel.

Rotary citrus fruit peel cutter made by an Italian firm on show at the Medina Fair.

News Digest

Stronger milk bottles wanted

The health committee of the Association of Municipal Corporations, which represents borough councils throughout the country, has been making an investigation into whether action should be taken either to ban the use of glass bottles for the distribution of milk or to strengthen these bottles during manufacture by coating with polythene or some similar substance.

The possible use of cartons for the supply of milk was also studied.

The committee says this probe followed a case where samples of milk were found to contain glass fragments from the bottles.

It was pointed out, the report states, that damage to bottles may occur during the bottling process, but perhaps the greatest danger of splintering arose during transport.

Says the report: "While bottles may be perfectly intact when they leave the supplier's depot, owing to their handling and the type of container which is generally used, coupled with the jolting they receive whilst in transit by road, when they reach the consumers the milk may contain glass splinters."

The committee says the matter was taken up with the Ministry of Agriculture, Fisheries and Food, who stated that "the British Standards Institution has issued a specification for milk bottles. The durability and toughness of the glass has, however, not been specifically stated."

The report continued: "The Glass Manufacturers' Federation were represented on the committee and are, no doubt, concerned to supply the dairy industry with sturdy bottles.

"The glass milk bottle has proved so far to be more economical than the non-returnable carton. Any additive in the making of glass bottles would need to be of a type which would not cloud the glass in any way, otherwise bottles coming off the washer before filling could not be visually examined for freedom from broken glass and other extraneous matter.

"The dairy trade is itself concerned to have milk bottles of the sturdiest glass and so eliminate their losses from breakages and their liability in respect of broken glass in bottles of milk.

"Glass in milk is to be deprecated, but considering the many millions of glass bottles in use daily, the number of cases where glass and other matter is found in bottles is extremely small."

One suggestion was that damage occurred during filling rather than during transportation. Some bottlers were overcoming this fault by inserting rubber pads to cushion the bottles in the plant.

One medical officer of health said that milk was liable to be contaminated by the wax with which a carton was treated.

The report concluded that there did not appear to be any immediate prospect of an alternative to the use of milk bottles whose only fault was the risk of breakage.

Distribution payments for imported sugar goods

Under an Order made by the Minister of Agriculture, Fisheries and Food on the recommendation of the Sugar Board, distribution payments made by the Board on certain classes of imported composite sugar products, are now calculated by reference to a schedule of rates for different groups of products prescribed in the Order, instead of as hitherto by reference to the sugar and/or molasses content of individual imports.

This will greatly simplify the procedure for dealing with distribution payments on most imported goods containing sugar or molasses, and accords with a parallel simplification for the purpose of sugar duty which takes effect from September 1, by Order made by the Treasury under the Second Schedule of the Finance Act, 1957.

The new arrangement started on September 1.

Sultanas scarce

The Australian Dried Fruits Board believes that sultanas will be in shorter supply for the next 12 months, even if 1958 world crops are above average. However, with average crops in South Africa and Australia, raisins should again be in normal supply next year.

Final returns show that more than 50% of this year's Australian output of sultanas was allocated to Britain. The pack totalled 62,500 tons, of which more than 32,000 tons will be received by this country.

Factory inspection plan rejected

A suggestion that foodstuffs should be sampled in the factory rather than in the shops has been rejected after consideration by the health committee of the Association of Municipal Corporations. It was stated that food should be sampled frequently and as near to the customer as possible.

Which war?

Joiners renovating office equipment during recent alterations at the Godley, Hyde, Cheshire, factory of T. Wall and Sons, Ltd., were surprised to find the words "Smokeless Powder for Cannons" stamped on the underside of a desk top.

The factory, originally a margarine plant, dates back to 1890. The army first used smokeless cannon powder in 1891, although present-day cordite is sometimes officially referred to as "powder." Nevertheless the Imperial War Museum think the desk top is probably of late-Victorian origin.

Irradiation conference

Approximately 100 British scientists and twenty from overseas countries attended a symposium on Irradiated Foods held recently at Cambridge. They included the two main groups which are investigating this work—the Low Temperature Research Station, D.S.I.R., at Cambridge and the Technological Irradiation Group of the Isotope Division at Harwell—as well as a large contingent from industry and representatives from universities and other interested organisations. The meeting was the largest devoted solely to this work and the most comprehensive in scope to have been held outside the U.S.A.

The symposium was held at a particularly apt moment. After its early work on irradiation, the Low Temperature Research Station had to stop the researches owing to the calls of more pressing work. The researches were re-started in 1955, with the help of scientists provided by industry, with the proviso that the situation was to be reviewed after two years. This period is now finishing and a decision is to be taken very shortly on the future of the team, both in the light of its achievements and the future possibilities of the process. A comprehensive survey of this research work appears in the October and December issues of FOOD MANUFACTURE.

The factory at Scarborough, Toronto, recently acquired by John Dale Ltd.

Canadian firm acquired

It has been announced that John Dale, Ltd., have acquired Modern Containers, Ltd., of Toronto, the largest collapsible tube manufacturers in Canada, and a Company which has been established for over 20 years.

The name "John Dale" has been well known in the packaging industry in Great Britain for many years. In 1953 the English Company started operating in Toronto under the name of John Dale (Canada), Ltd., making plastic caps and metal boxes, and in acquiring Modern Containers, Ltd., they now have in Canada facilities for manufacturing a similar range of packages as are made by the three factories which form the Packaging Division of the English Company.

This range covers collapsible tubes, rigid aluminium extruded containers of all types, metal stampings, tinplate and aluminium boxes, plastic screw caps and other plastic mouldings. In addition, they have an up-to-date sheet metal decorating department.

Modern Containers are the oldest collapsible tube makers in Canada and supply over half the total requirements of the Canadian market. Production was originally carried on in two factories at Toronto and Ottawa. In 1953 and 1954 these factories were closed down and production was centralised in the present modern plant at Scarborough, an industrial area of Toronto.

The approximate number of employees is 300 and customers include the major users of collapsible tubes such as Colgate-Palmolive, Ltd., Lever Bros., Ltd., Proctor and Gamble Co., of Canada, E. R. Squibb and Sons, of Canada, Ltd., and also the leading cigar tube users.

The company will continue to be managed by Mr. C. D. Hill under the new board of directors.

Change of address

Spencer-Bonecourt-Clarkson, Ltd., have moved to 28, Easton Street, London, W.C.1. Telephone: Terminus 7466.

Improved kieselguhr

Industries which use calcined kieselguhr (diatomaceous earth) as a filtration aid will welcome the five improved grades which are now available from Charles H. Windschuegl, Ltd. These are drawn from new deposits of fresh gur and are said to show an increase of up to 16% in bulk volume and an extended life cycle.

Improvements have been made possible by the use of new quarrying techniques and the development of artificial methods of drying the gur that will not damage in physical structure.

Sugar and biscuits

The fourth International Sugar Exhibition will be held in Amsterdam from April 22 to 30, 1958. Exhibits will be grouped under 10 different headings, which will give a thorough coverage of all facets of the sugar-producing and processing industries.

A congress on automation and packing biscuits will be run in conjunction with the exhibition.

Frozen food merger

One of the largest frozen food companies came into being last month when Eskimo Foods, Ltd., was formed by a merger between Grimsby Frozen Products, Ltd., and Frigidfruits, Ltd. Both are subsidiaries of Associated Fisheries, Ltd., said to be the largest trawling group in the world. The chairman of the new company is Mr. W. A. Bennett, head of Associated Fisheries, and Mr. J. G. Sprott will be managing director.

Eskimo Foods, Ltd., will produce and market a complete range of frozen fish and meat products, poultry, fruit and vegetables, both for normal retail outlets and for hotels, restaurants, large scale caterers, airlines and shipping lines. It will control three modern fish factories, a large fruit and vegetable factory, and a poultry farm.

Erections and Extensions

W. J. Brookes and Sons, Ltd., bakers, Skerton Road, Trafford Park, Manchester, 16, are having flour silos erected.

■

Schweppes, Ltd., mineral water manufacturers, have plans in hand to improve and extend their factory at Killearn Street, Glasgow.

■

Hadrian Supply Co., Ltd., 7, High Street, Wallsend, are planning the erection of a bacon curing factory at West Cherton, North Shields.

■

Orpiro Food Products, Ltd., have had plans approved to build extentions to their factory at Woodlands Park Avenue, Cookham, Berks.

■

Amalgamated Fruit Packers (Smarden), Ltd., Marley Farm, Smarden, Kent, have opened a packing factory at Beechings Way, Gillingham, Kent.

■

Campbell, Henderson and Co., Ltd., Broomielaw, Glasgow, C.1, are planning to establish a distillery at Campbeltown, Argyllshire, at an estimated expenditure of £250,000.

Highfield Foods, Ltd., manufacturers of macaroni products, of Halifax and Yarmouth, have opened a factory at Tenterden, Kent, for the production of noodles, shells, rings, alphabets, vermicelli and spaghetti.

■

The Nestlé Co., Ltd., Hayes, Middx., have plans in hand for the construction of head office premises on a site at Wood Street and Staining Lane, London, E.C.2, at an approximate cost of £500,000.

■

Monmouthshire Co-operative Bakeries, Ltd., have opened a £200,000 bakery at Pontrhydyrun, Cwmbran New Town, South Wales. This bakery is designed to produce 1,400 loaves per hr. Only bread is being produced at present. Production of confectionery will begin when the plant is in full production.

■

H. E. Daniel, Ltd., essence manufacturers, of Norwood, London, have opened part of a branch factory under construction at North Farm Estate, High Brooms, Tunbridge Wells, Kent. The factory is scheduled for completion by the end of December, and full scale production is expected to begin at the end of next year.

New sales office

An "off-the-shelf" service will be provided in the North of England by the new sales office which has been set up in Newcastle by Renold Chains, Ltd., who state that the office will hold a comprehensive range of chains, wheels and accessories. Service engineers will be available to help customers.

Potato crisps more profitable

Net profits of Smith's Potato Crisps, Ltd., rose from £276,593 to £367,803 last year, reported Mr. Fermian Le Neve-Foster, the company chairman. During the year under review, the company sold approximately 3 million lb. of crisps more than in the previous year. A "windfall in an extraordinary year for potatoes" was partly responsible: although all other costs had risen, a bumper crop caused potato prices to fall steeply.

An active policy of capital development has been pursued by the company and building of the new factory at Corby in Northamptonshire has progressed so rapidly since March that production has partly begun.

Ventilation and fire

At the Building Exhibition, Olympia, London, Colt Ventilation, Ltd., is virtually exhibiting *throughout* Olympia, for the building is now equipped with a Colt system of ventilation.

The majority of Colt equipment is manufactured in a high grade aluminium alloy, so that not only does it look attractive, but also its lightness in weight permits easy fixing without structural alteration.

It is also possible to re-site Colt units subsequently to meet the changes in production layout which often take place in expanding factories.

A particularly interesting feature on the stand is the range of dual-purpose fusible link heat and smoke exhaust ventilators, which is the new Colt idea of combining ordinary industrial ventilation systems with a fire venting safety system. Each fire vent is operated by ordinary controls for day-to-day requirements, as well as by fusible link, so that the moment the temperature in the roof reaches 150°F. —indicating that a fire has broken out —the link holding the ventilator louvres in position fuses, and the ventilator falls open automatically to release heat and smoke before they can build up and make fire-fighting difficult or impossible.

The Jaguar fire earlier in the year has given a lot of publicity to this idea of fire-venting, and Colt have carried the principle one stage further by using ordinary ventilators to fulfil the purpose of a fire vent as well, making the system an economic proposition for every firm.

OBITER DICTA

● Alderman John Grogan, Lord Mayor of Birmingham, has eaten 200 officials meals since he took office in May—*and worn out his dentures.—Daily Mail.*

● It will amuse our British friends to learn that we consider it austerity to eat less beef and more chicken.—*M. Gillard, French Finance Minister.*

● A new tablet, it is announced, takes away the "winey taste" when put into a glass of wine, and instead makes it taste like "a sweet lemon-flavoured cocktail."—*Daily Mail.*

● Demonstrations of Australian wines have shown that, with some customers, if they are given a dry wine which is called "dry" they dislike it. But if they are given a sweet wine which the demonstrator tells them is dry, they love it.—*Wine shipper, F. S. Burnett.*

● A café proprietor who dumps his rubbish on a bomb-site sent a message to Portsmouth magistrates explaining his problem. He wrote: "I tried to burn it, but it wouldn't combust. I tried to bury it, but the ground was too hard. I should have thought of buying a boat and dumping it in the harbour."—*Morning Advertiser.*

● The most unusual use for bread is in finding a corpse. There is a widely held superstition that if a loaf weighted with quicksilver is set on a river, it will travel towards, and remain motionless over, the spot where a drowned body is lying on the bottom.

This strange method was actually used in the case of a missing person drowned in the North of England in 1945.

It did, in fact, reveal the approximate position.—*Cynthia Jay.*

● Several American toy firms are hastening to put on the market miniature artificial satellites and launchers. They will sell for 30s. American barmen have also come up with various "Sputnik" cocktails, the basis for which in each case is vodka. —*Daily Telegraph.*

A bartender in California has risen to the occasion with a vodka-based "Satellite Cocktail." It is reported that "one patron had two and took off, bleeping."—*Manchester Guardian.*

Forthcoming Events

Society of Chemical Industry

Food Group

Friday, November 1. Joint meeting with the Manchester Section of the Society of Chemical Industry, 6.30 p.m. in the Chemistry Lecture Theatre, Manchester University. "The Ethics of Food Advertising with reference to Special Claims"; "Food Advertising Law," by C. A. Adams, C.B.E., "Ethics of Food Advertising," by Ernest Godbold.

Monday, November 4. Joint meeting with the London Section of the Society of Chemical Industry, 6.15 p.m. in the Society's Rooms, 14, Belgrave Square, London, S.W.1. "Technological and Analytical Problems Involved in the Use of Food Additives": Introductory address by J. R. Nicholls, C.B.E., 'Flour,' by J. Williams, 'Bread and Flour Confectionery,' by R. D. Mason, and 'Fat and Meat Products,' by F. H. Banfield.

Wednesday, November 13. Conversazione, by invitation of Imperial Chemical Industries, Ltd., 8 p.m. at Imperial Chemical House, Millbank, London, S.W.1. Admission by programme only.

Wednesday, November 27. Ordinary meeting, 6.15 p.m., in the Society's Rooms, 14, Belgrave Square, London, S.W.1. "Some Applications of the Karl Fischer Reagent to Sugar Confectionery Analysis," by A. G. Sansome and Miss M. J. Phillips; "Flour: Lipid Characterisation: Chromatographic and Other Studies," by N. Fisher, Mrs. M. L. Ritchie and J. B. M. Coppock.

Institute of Refrigeration

Thursday, November 7. "A Review of Methods for Odour Control in Refrigerated Space," by Dr. W. Summer.

New slaughterhouse

A new slaughterhouse alongside the Willesden meat products and bacon factories of T. Wall and Sons (Meat Products), Ltd., is nearing completion. It will have a capacity of at least 10,000 pigs per week and is expected to come into operation before the end of the year.

Viscosity standard revised

For the first time since 1937 the British Standard for the determination of the viscosity of liquids in c.g.s. units has been revised.

The revised version describes both capillary and falling sphere viscometers, including several new types.

An important change is that water is now the sole reference liquid and the capillary type viscometer is to be calibrated against water at 20·0°C.

PEOPLE

MR. J. H. BUCK, marketing director of Alfred Bird and Sons, Ltd., has been appointed European Development Manager of the General Foods Corporation to co-ordinate their several and rapidly growing interests throughout Europe. MR. C. J. CROSS BROWN, director of the A. C. Nielsen Co., the marketing research firm and specialists in grocery trade problems, has joined Alfred Birds to head the company's marketing organisation.

*

MR. H. M. BRAID and MR. W. H. GREAVES have been appointed directors of United Glass Bottle Manufacturers, Ltd. Mr. Braid is a director of Distillers Co., Ltd., and managing director of John Walker and Sons, Ltd., and Mr. Greaves is managing director of Tanqueray, Gordon and Co., Ltd.

MR. F. COWARD, F.C.I.S., has relinquished the secretaryship but remains on the board. MR. B. MOORHOUSE, A.C.I.S., has been appointed secretary in his place.

*

The Department of Health for Scotland is increasing its inspectoral coverage to meet the demands of the new Food and Drugs (Scotland) Act.

The seven former milk inspectors will become food and dairy officers, with MR. C. H. CHALMERS as chief officer. MR. A. W. RITCHIE, who until recently was food hygiene officer, retired at the end of August.

*

MRS. A. E. CLARK, has just been appointed welfare supervisor at Smedley's, Ltd., Spalding (Lincs.) factory.

Obituary

Mr. ARCHIBALD MCLAURIN, J.P., whose father founded the paper manufacturing firm of Smith and McLaurin, Ltd., has died at the age of 92. He was buried at Woodside Crematorium, Paisley, Scotland.

Mr. McLaurin took an active part in the affairs of the company right up to his death. He was responsible for many improvements and innovations in the Cartside Mill, both in converting methods and in the use, application and development of colours and colour matchings. He pointed out frequently that colour matching by electric arc light was first undertaken at the Cartside Mill, while hot air driers, then a complete departure from the old method of drying, were installed in the buildings, and operated by blowing hot air through boilers similar to railway engine boilers.

Technical Press Review
November

Dairy Engineering.—Brushes in Dairy Cleaning Operations; New Developments in Ice Cream Manufacture; Instrumentation as Applied to the Production of Evaporated and Dried Milk—2.

World Crops.—Concentrate Spraying; Introduction of a New Crop Protection Chemical; Biological Control of Noxious Plant Species in Hawaii; The Termite—1, A Social Insect; ABC of Weed Control.

Manufacturing Chemist.—Review of Distillation Equipment; Temperature Measurement in the Chemical Industry; Glycerin in Aerosols; Progress Reports: Disinfectants and Disinfection, Hormones, Perfumery and Essential Oils.

Chemical and Process Engineering.—A Graphical Method for the Calculation of Simultaneous Heat and Mass Transfer; Centrifuging—1; Correct Selection of Drying Equipment; Self-Contained Factory for Catalyst Manufacture.

Atomics.—German Atomic Pioneers; Nuclear Power and Energy Economy; Nuclear Progress in Germany; Atomic Research in North-Rhine Westphalia; Heavy Water in Germany; The "Merlin" Research Reactor; Radiochemical Developments; Germany's Third Atomic Power Station; INTERKAMA—A Selection of Equipment from the Show.

Petroleum.—Corrosion Damage Detection; Lobitos Platformer at Ellesmere Port, Ches.; Petroleum Transport—Review and Prospects; Reconstruction of the Syrian Refinery; Oil Developments in France and North Africa; Oil Geology of North Africa; Pipeline Transportation; Milford Haven Report.

Paint Manufature.—Modern Synthetic Resins for Surface Coatings—FATIPEC Congress; Resin Guide; Research and Development in Resins: Thermosetting, Thermoplastic and Vinyl Resins; Alkyd Resins.

Automation Progress.—Control and Instrumentation of a New Oil Refinery; Photocell Counter Helps Film Spool Production; Low Power Information Storage Device; Automatic Equipment Produces Electric Motors; Modern Semi-Automatic Plating Shop; The Hall Effect.

Corrosion Technology.—Corrosion in Tar Stills; Corrosion Resistance of Cobalt; Corrosion Investigation by Electrical Measurements; Review of the Corrosion Convention and Exhibition.

Fibres.—The Application of New Ideas in Industry; Extending the Use of Man-Made Fibres; Kenaf in India; Blending Mesta in Jute Manufacture.

Overseas Enquiries

Luxembourg: Dairy processing equipment

The Board of the Milk and Dairy products combine "Centrale Luxembourgeoise du Lait" (Celula) of Bettembourg, Luxembourg, have been authorised to raise a loan of 7 million francs (£50,000) for the purchase of modern dairy processing equipment. The loan will be taken up in step with purchases. The combine handle about 97,000 litres of milk per day.

Bahrain: Frozen meat, fish, fowls, squashes, sweets and toffees

Moon Stores, P.O. Box 247, Bahrain, would like to get in touch with British manufacturers of fresh frozen meat, fish and fowls as well as manufacturers of squashes, sweets and toffees who are not already represented in Bahrain.

Interested manufacturers should write direct to the Bahraini concern with, if possible, prices, labels and catalogues. They should notify the British Political Residency, Commercial Secretariat, Juffair, Bahrain, that they have done so.

New Zealand: Ice-cream tablet cutting, enrobing and wrapping

W. Arthur Fisher, Ltd., Wakefield, Chambers, Wellington, are interested in representing on a sole distributorship basis, a U.K. manufacturer of ice-cream tablet cutting, enrobing and wrapping plant. The equipment would need to have a maximum capacity of 100 slabs per min.

The Wellington firm are considered to be a suitable connection for U.K. firms.

Interested manufacturers should write direct to W. Arthur Fisher, Ltd., at the same time notifying the U.K. Trade Commissioner, P.O. Box 369, Government Life Insurance Building, Customhouse Quay, Wellington, C.1, that they have done so.

Tanganyika: English beer and stout

Kassum and Partners, Ltd., P.O. 1042, Dar es Salaam, would like to receive offers from British suppliers for English beer and stout for the Tanganyika market.

Kassum and Partners, Ltd., are at present importing a number of items from the U.K., and they are considered to be a suitable connection for British firms.

Exporters interested in this enquiry should write direct to Kassum and Partners, Ltd. They should notify the U.K. Trade Commissioner in East Africa, P.O. Box 220, Memorial Hall, Nairobi, Kenya, that they have done so.

Food News Overseas

New Laboratories for Essence Factory

A new building, consisting of three laboratory units, was recently opened at the Hilversum factory of Polak and Schwarz by the burgomaster of that city.

Each of the three laboratories is to have its own specialised function. The first, described as a creative unit, will be devoted to research on new flavours. The second, the analytical unit, will be used for the testing of all raw materials and finished products for composition and purity. The third laboratory, the practical trial unit (a section of which is pictured above), is equipped with smaller versions of the apparatus used by the industrial clients of the firm. Here the various products will be tested for behaviour under practical conditions of use before being released for sale. The equipment includes, a bottling plant, an ice cream plant, kneading and mixing machinery, and a baker's oven.

The new building also contains an administrative section, from which technical advice is given to production units throughout the world.

Dairy reorganisation in Luxembourg

The dairy industry in Luxembourg is being rationalised and centralised. This programme will be completed in 1958 when the new Luxembourg Dairy, covering the southern part of the country, will be completed. A dairy for the northern part of the country has just been opened with a capacity for treating 100,000 litres of milk and 22,500 ls. of cream daily. Before the war, Luxembourg possessed 271 small dairies spread all over the country which have now been absorbed by twelve large dairies where 150 million ls. of milk are being treated annually. With the opening of these dairies, the Luxembourg farmers' association hopes to be in a better position to meet the conditions arising out of the Common Market. The programme is financed and executed by the Farmers' Co-operative, with Government support. U.S. Mutual Aid Funds are being contributed to the programme, and Swedish technicians have helped in the planning.

Greenland fishing plants

According to a Danish report, the Royal Greenland Trading Co. will spend between Kr. 60m. and 70m. in the next six or seven years on new fishing plants at Jakobshavn, Holsteinborg, Godthaab and Frederikshaab, and eventually at Egedsminde.

Sugar mill in Pakistan

The New Zealand Government has agreed to contribute £300,000 towards the establishment of a sugar mill at Dewanganj, E. Pakistan, which will be set up by the Pakistan Industrial Development Corporation.

New Danish cannery

The Beauvais Food Canning Co. has opened a new factory for handling fruit and vegetables at Svenninge, North Jutland, said to have an annual capacity of six million kg. The firm's Copenhagen factory will now concentrate on the canning of meats.

Natal sugar refinery

A sugar refinery capable of processing 20 tons of fine white sugar per hr. was recently opened at Sezela in Natal Province, South Africa. The plant cost £400,000. The owners, Reynolds Bros., are said to be planning a similar refinery at Gledhow, Natal North Coast, to be opened next year.

Japanese study alga

Ground-breaking ceremonies for the Japan Chlorella Production Institute took place recently in Tokyo. The Japan Dietary Life Association, with the help of a Government subsidy, is said to be spending about £34,000 on the mass production of this single-cell alga and investigation of its possibilities as a source of protein and other food elements.

Film butter pack

Individual pats of butter are wrapped in a special *Cellophane* by a new wrapping machine which has been introduced in the U.S., according to a recent press report. The pats, which are intended for use in American restaurants, are packed on the machine at a rate of between 600 and 1,000 lb. per hr. It is believed that the machine will be leased out to dairies and will be able to provide savings both in labour costs and in unused butter since public health rules require that unused butter sold openly must be thrown away.

The butter is formed into pats or individual helpings which are deposited between ribbons of *Cellophane* and other heat-sealing material and the two films are sealed together, thus forming individual airtight packets. Finally, the pats are automatically packaged into serving trays each of which contain approximately 2½ lb. of butter.

Packaging

Wire packaging tool

For use when ribbon wire is the most economical method of securing packages the *Power* ribbon wire hand tool has been introduced by Fredk. A. Power and Son (Box Strapping), Ltd. The tool is for the use of ribbon wire approximately ·28 in. wide × 0·025 in. which is equivalent in strength to 5/16th in. steel strapping but is cheaper. The twisted joint formed by the tool is said to eliminate the need and additional cost of a separate seal.

Tape dispensers

A range of three tape dispensers has been introduced by Leon Davis and Co., who market *Oyster Brand* gummed tape. The *Spread-O-Matic* is designed to dispense tapes from ½ to 1½ in. wide from reels up to 600 ft. long while the length of tape dispensed is from 3 to 7 in. The *Oyster Rex* No. 4 and No. 8 dispense tapes from 1 to 4 in. and 1 to 8 in. wide respectively, in lengths of from 4 to 36 in.

A special platen is fitted to ensure that the tape is wetted along the whole of its length. In the two larger machines there is a polythene water reservoir at the side of the machines which has a non-return valve allowing it to be removed, filled and replaced without the contents being spilled.

The Industrial Sellotape Division of Gordon and Gotch, Ltd., has introduced a dispenser which allows various widths, as well as various lengths, to be cut from a standard roll of *Sellotape*, thus effecting considerable economies in its use. The machine has seven cutting blades, which can be set to slit the tape to any required width between ½ in. and 2 in.

Lengths of from ½ in. to 5 in. are obtainable by the adjustment of a setting dial at the side of the machine.

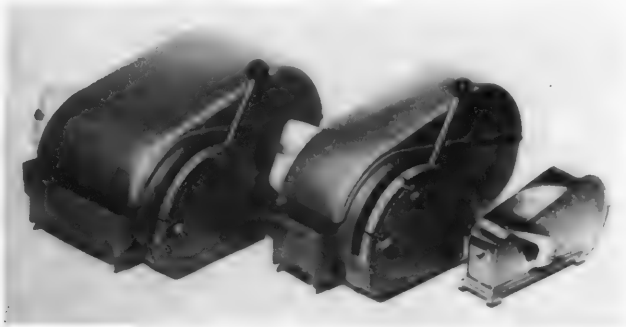
Bonded wrapping

A new regenerated cellulose/polythene bonded film, *Telcotect*, has been introduced by the Telegraph Construction and Maintenance Co., Ltd. The cellulose film is an excellent barrier while the polythene is impermeable to water and water vapour as well as being unaffected by most inorganic chemicals.

Good burst strength and tear strength, flexibility and proof against cracking (down to -40°C.) are claimed for the material, which is heat-sealable and may be used for vacuum packaging.

A three dimensional effect may be given by printing on the cellulose before it is coated with polythene.

Twisted joints can be made in ribbon wire strapping with the *Power* tool illustrated above.



Three new gummed tape dispensers.

Four fl. oz. tube of a new fruit sauce.

Sauce in tubes

A new sauce, *Westminster* brand, has been marketed in collapsible tubes. The tubes, lined to prevent contamination, are made by John Dale, Ltd. The sauce makers, Keddie, Ltd., are having the tubes filled by a specialist packer, Evans Chemicals, Ltd. They will continue to do this until demand makes it worth while to buy the special machinery required.

Colour sells biscuits

In the belief that biscuits are high up on the impulse-sales list, Meredith and Drew, Ltd., have switched their range of biscuit wrappings to multi-coloured, printed *Diolam*, supplied by Transparent Paper, Ltd. The company has now placed 10 of these new packs on the market and say that already sales have increased.

Flush-waxing tubes

The development of new machines of American design has enabled Venesta, Ltd., to discard the spray-waxing system of coating metal tubes in favour of flush-waxing.

Printed and capped tubes are mounted on hollow pins and pass by means of a conveyor through a chamber with a temperature of 121°C., where molten wax is pumped into each for a few seconds via the ends of the hollow pins. It is stated that a continuous and regular film of wax, of constant thickness, can be obtained by this method.

Waxes of higher melting point than usual are employed in this method and these are stated to impart a harder and more even coating to the tubes without any danger of the nozzle of the tube being bridged.

Here is a selection of beer cans now being made by the Metal Box Co. Ltd. The company now has two lines working on beer cans and a third is going into production soon. Many of the cans are printed with the brewer's traditional designs thus eliminating labelling while keeping alive the goodwill established by well-known brands.

Redesigned labels

A redesign programme for Chivers' fruit and vegetable labels has been completed by T.H.M. Partners to meet requirements of self-service stores. The pale blue associated with the canned fruits has been retained in a slightly fresher shade, with red introduced as a second background colour.

In the vegetable range, an illustration of the contents appears against a wood-grained background. While the packs are individual in design, a family resemblance has been established between the ranges and extended to include the new freshly frozen peas pack, which is adapted from the design for canned peas. For this pack, dark green, light green and black have been used, and the description of the product is carried in white on a black flash. The carton comes in 6 oz. and 12 oz. sizes with instructions for use on the bottom of the pack.

Polythene icing packs

Polythene bags containing cake icing and piping jelly for direct application to cakes are being sold by Fondova Sales, Ltd. Each bag contains in correct measure either 4 oz. of cake icing or 3 oz. of piping jelly. Simple instructions are included with the packs.

Show-case sells marzipan animals

By using a carton based on a shop display-case for their novelty cake decorations, Green's of Brighton consider that their latest product, nine marzipan animals, is fully protected from damage and shop-soilng and well presented at the same time.

The cardboard carton is made in two sections—a shell, with a film window, and a slide. The nine marzipan animals, coloured miniature puppy-dogs and teddy bears, are arranged in rows of three in the "shelves" of the slide. The shell, with a window of Courtaulds' cellulose acetate film, is then slipped over to secure and display the decorations.

Fish containers

Containers with quick-release lids have been designed for the fishing industry by the Warwick Production Co., Ltd., who state that they are manufactured as pressings in aluminium and are available in two depths, 6¼ in. and 8¼ in.

The containers, which can be interstacked, measure 27¾ in. by 14¾ in. and have grooved bottoms. Rounded corners facilitate cleaning and full beading gives strength to the rim.

A quick-release fastener is recessed into the lid which is also grooved both for strength and to facilitate stacking.

Cheaper bulk produce bags

The Metal Box Co., Ltd., announce that the price of their standard bulk produce bags made of *Diothene* has been reduced by about 12%. These punched bags measure 20 in. by 36 in. and are made in 250 gauge *Diothene*. They are used for distributing prepacked produce in bulk.

The company is also producing a similar bag 2 in. shorter at a lower price and a returnable bag of 400 gauge, sized 20 in. by 36 in., either plain or printed with a repeat design in one colour. The heavy gauge is said to be light in weight, compact and easy to store as well as costing less than a rigid container.

Above: **Re-designed range—the vegetables are shown against a light wood grain background. The other background is fresh green.** *Right:* **A new collapsible tube pack for John Walker and Co., makers of "Royal Scotch" golden syrup, produced by Flexile Metal Co. Ltd.**

New Companies

Apple Tree (Cider), Ltd. (587906.) 14, Bryanston Road, London, W.1. Brewers and licensed victuallers, manufacturers and bottlers of and dealers in cider, stout, beer, spirits, wines, etc. £100. Dir.: H. B. Grice.

Baxter and Foster (Biscuits), Ltd. (588886.) 3, Westfield Terrace, Leeds, 3. £2,000. Dirs.: J. Foster, J. Foster, Jr., and S. Baxter.

Bienfoods, Ltd. (587388.) Blenders and mnfrs. of and dlrs. in food products. £1,000. Dirs.: D. F. Blakesley, Ethel Stanton and Elizabeth Browne.

British Turkey Federation, Ltd. (588123.) To acquire and assume the business of an unincorporated association of the same name. Company limited by guarantee without share capital. Subs.: R. G. C. Watson, A. M. Melville, R. Paisley, J. S. Lintern, F. A. Bourne, H. B. Marden-Ranger and W. A. Motley.

Broiler Services, Ltd. (587751.) Rough Hill, East Hanningfield, nr. Chelmsford, Essex. Consultant in the production and processing of table poultry. £2,000. Dirs.: J. L. E. Ogier and F. H. Grove.

Burton Casing Co., Ltd. (587981.) 87a, High Street, Orpington, Kent. Sausage casing distributors, etc. £2,000. Dirs.: F. S. and Gladys M. Burton.

Canbrew Holdings, Ltd. (587459.) To acquire interests in any patents and the like relating to the mnfr., processing, treatment and storage of beer and other beverages. £100. Dirs.: Joyce Galloway and I. L. Hargood.

Cardiff Meat Packs, Ltd. (587460.) £2,000. Dirs.: G. R. Pryce, P. R. Pryce, H. I. and Patricia M. Knight.

G. and M. Confectionery Co., Ltd. (588366.) 4, Victoria Avenue, Didsbury, Manchester, 20. £2,000. Dirs.: J. Goulding and Eva C. Mollart.

Hesketh's (Bellamy and Witham), Ltd. (587426.) 30, Birley Street, Blackpool. Importers and exporters, mnfrs. of and dlrs. in cooked foods. £15,000. Dirs.: I. Bellamy, R. Witham, I. Gibrail and C. R. Walter.

Holdridges, Ltd. (589054.) Biscuit mnfrs., bakers, etc. £5,000. Subs.: J. W. E. Grundy, 43, Trinity Street, Hanley, Stoke-on-Trent, and Doreen Viggars.

K. E. Jameson and Son, Ltd. (589022.) Wine and spirit shippers, importers, exporters, etc. £100. Subs.: J. S. Capes, 6, Stratford Place, London, W.1, and A. F. Sales.

Jaunty Foods, Ltd. (588900.) The Side, Newcastle-on-Tyne, 1. Mnfrs. of dog, cat, cattle and animal foods, etc. £100. Dirs.: G. A. Palmer, H. Pickles and A. Robertshaw.

Nene Fishing Co., Ltd. (587429.) Fish Dock Road, Grimsby. £8,000. Dirs.: R. Smith, C. J. Little, H. Smith and L. E. Ray.

M.M. Poultry Packers, Ltd. (588833.) £100. Subs.: A. W. Archer, Warwicks, Kings Road, Sunninghill, Berks., and R. C. Boiling.

Severn Dairies (Newport), Ltd. (587899.) 76, Commercial Street, Newport, Mon. £500. Dirs.: T. F. Rees and Jill Harris.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Trade Marks

GLOWS.—758,532. Non-medicated confectionery, but not including ice cream or any goods of the same description and not including any confectionery containing mint. **John S. Derbyshire and Son, Ltd.,** Traffic Street, Nottingham.

"BEAM."—761,384. Biscuits (other than biscuits for animals). **William MacDonald and Sons (Biscuits), Ltd.,** Glengarry Biscuit Bakery, Earl Haig Road, Hillington, Glasgow, S.W.2.

COCKTAIL SALAD.—761,489. Non-medicated sugar confectionery. **J. Lyons and Co., Ltd.,** Cadby Hall, London, W.14.

GUARDSMAN.—761,413. Fresh fruits and vegetables. **Acre and Co. (Covent Garden), Ltd.,** Folgate Street, London, E.1.

LEMORANA.—757,458, and **LIMORONA.**—757,458. Non-alcoholic drinks and preparations for making such drinks, all containing lemon juice or lemon essence and included in Class 32. **Thomas and Evans, Ltd.,** Hannah Street, Porth, Glamorgan.

SUN-DAY.—764,447 and **SUNDAY.**—764,448. Vegetables and fruit, all being preserved, dried or canned. **Spalding Pea Co., Ltd.,** Station Yard, Spalding, Lincs.

TETLEY.—B752,364. Tea, coffee, cocoa, roasted chicory and essences included in Class 30. **Joseph Tetley and Co., Ltd.,** 89, Worship Street, London, E.C.2.

GLOABE.—754,387. Cereal preparation for making biscuits for human consumption. **D. J. and P. D. Patel,** trading as Dose-Patt, "Trevona," Ashtead Woods Road, Ashtead, Surrey.

PENWALD.—764,361. Fruits and vegetables, all being preserved and canned. **Olympia Canning Co.,** Olympia, Thurston, Washington, U.S.A.

SPEACO.—764,446. Vegetables and fruit, all being preserved, dried or canned. **Spalding Pea Co., Ltd.,** Station Yard, Spalding, Lincs.

ANGELITA.—760,388. All goods in Class 29. **Union Cooperatavas Limitada,** San Carlos, Calle Rividavia, Esperanza, Santa Fe, Argentine.

COUNTRY COTTAGE MARGARINE.—760,739. Margarine. **James Crean and Son, Ltd.,** Naylor Street, Liverpool, Lancs.

JOLLY JEST.—763,736. Canned and bottled fruits. **Societa Per Azioni G. Colombani & C.,** Portomaggiore (Ferrara), Italy.

GOLDEN BOUNTY.—764,136. Butter. **Adams (Wholesale), Ltd.,** Buxton Road, Leek, Staffordshire.

MARZIA.—759,644. Mixtures consisting of sugar, nuts, cereals and flavourings for use in the preparation of marzipan and of substitutes for marzipan. **R. Atcherley and Co., Ltd.,** Victoria Street, Liverpool, 1.

JOYCRUST.—B762,048. Bread. **Joicies (Derby), Ltd.,** East Street, Derby, Derbyshire.

NEWBELLE.—763,421. Non-medicated confectionery. **Bryants Confectionery Co., Ltd.,** Exmouth Street, Birkenhead.

BAZOOKA.—763,834. Chewing gum. **Topps Chewing Gum Incorporated,** 254-36th Street, Brooklyn, New York.

LIPSET.—763,940. Biscuits (other than biscuits for animals). **William MacDonald and Sons (Biscuits), Ltd.,** Glengarry Biscuit Bakery, Earl Haig Road, Glasgow, S.W.2.

GANDEX.—751,968. Meat and sausages. **General Meat Products, Ltd.,** 69, Praed Street, London, W.2.

NAZEBOURNE.—B759,847. Meat; and fish, poultry and game, none being alive. **Nazebourne Pig and Poultry Products,** "The Ashes," Old Nazing Road, Broxbourne, Herts.

FRIONOR GRILLETS.—760,508. Fish (not live). **Norsk Frossenfisk A/L,** Drammensveien 20, Oslo, Norway.

New patents are from the Journal of Patents and new trade marks are from the Trade Marks Journal. In each case permission to publish has been given by the Controller of Her Majesty's Stationery Office. Each of the publications is obtainable from the Patents Office, 25, Southampton Buildings, London, W.C.2.

COMPANY MEETING

SCRIBBANS-KEMP

Current Trading Improvement

The 30th annual general meeting of Scribbans-Kemp, Ltd., was held on October 7 in London, Mr. H. Oliver-King (chairman and managing director) presiding.

In his statement to shareholders the chairman comments on the factory reorganisation which it was expected would show results in the accounts ending in March, 1958.

He reviewed the progress and activities of the various manufacturing divisions, comprising sugar confectionery, cakes and biscuits, and he said that the retail companies had had a satisfactory year, but the overseas companies had been meeting stiff competition.

The chairman continued: Exports continue to be a bright spot. In total we are up by 16%, and the current year also promises well. A recent development has been the organisation of exports from Canada to the U.S.A. This is developing on quite a substantial scale.

The completion of the purchases of Bensons and Smiths was made during the year, and, since the end of the year, the retail companies have acquired the share capital of London Kiosks, Ltd.

The £1,600,000 fresh capital raised in 1956 was spent mainly on the purchase of Benson shares, which has proved very profitable; and for the large extension to the Grimsby biscuit factory to cost approximately £1,000,000. In addition, the overdraft was eliminated.

After reviewing the year's satisfactory result the chairman said: Figures of turnover and profits for the first four months of the current trading year show a substantial advance on last year and would appear to give good ground for optimism.

The report was adopted and the total distribution of 11% was approved.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Canned cod livers

B.8355. *We wish to obtain some information on the canning of cod livers.* (Finland)

Only fresh cod livers must be used. On arrival at the cannery all livers should be held in metal containers, packed in finely crushed ice, until used. All livers must be thoroughly washed in clean running, cool water, and those not fresh or not white in colour must be discarded. The washed livers are brined in cool saturated pickle, containing a small amount of saltpetre, for thirty-five minutes.

Formula for this pickle consists of 9 gallons of water, 25 lb. table or dairy salt, and 10 oz. saltpetre. The pickle should be kept up to strength and changed frequently.

After brining, the livers are spread on trays and allowed to drain. They are then brought to the packing table, where they are placed in small tins such as are used for canning fish or lobster paste (3 oz. or smaller). The cans should be well filled, allowing not more than $\frac{1}{8}$ in. headspace. After exhausting the cans for approximately eight minutes in a steam or exhaust box, they are sealed and processed at 240° F. for thirty minutes (3 oz. cans). The cans are cooled in cold water immediately after removal from the retort.

Glacé cherries

B.8354. *Please supply recipe and method of producing glacé cherries.* (Eire)

The following is a recipe for glacé cherries, which is given as a basis for experiment:

The cherries are first exposed to sulphur fumes for about five hours in a sulphur cabinet. They are then put into wooden buckets and covered with water in which 1 oz. of sulphite of soda to each twenty quarts of water has been dissolved.

The cherries are pitted and blanched and kept in cold running water for about an hour, and then allowed to dry out on hurdles. The canning is done by placing the cherries in earthenware jars and pouring a syrup of 22° Beaume over them (when boiling), leaving one hour, then draining the syrup and boiling to 24° and again pouring over the cherries. Leave for twenty-four hours, drain the syrup and sugar, and boil to 25°, pouring over the cherries. Repeat the operation three times more every second day. The strength of the syrup is then increased to 27°. Three days later drain and increase to 28°. Three days later increase to 30°, adding to the syrup a small quantity of carmine to colour the cherries red. Resume the draining four days later, boiling the syrup at 32° by addition of glucose instead of sugar. Repeat this operation twice. At the next boiling increase the strength of the syrup to 33° by adding more glucose. This operation is repeated until the syrup is found to remain at 33° after four days contact with the fruit, which will show that they have absorbed all the sugar possible. The cherries should then be transparent and full of light and colour.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant machinery and materials, and also general information as follows:

B.8196. *Information on production and processing of olives.* (London)
B.8198. *Information on manufacture of liquid frozen eggs.* (London)
B.8204. *Information on manufacture of sausage meal.* (Dublin)
B.8205. *Manufacturers of machine for rolling bacon ribs.* (Lancs.)
B.8207. *Suppliers of fish protein and blood albumen.* (Bristol)
B.8208. *Information on quick freezing of bread and other dough products.* (Dublin)
B.8209. *Manufacturers of machinery for canning fruit and fruit purée.* (California)
B.8210. *Information on the use of Isoascorbic Acid in foodstuffs.* (Darlington)
B.8213. *Requirements for labelling jams, etc., for Gibraltar.* (Cork)
B.8219. *Manufacturers of a semi-automatic filling machine.* (Wembley)
B.8220. *Information on plant and processing canned meats.* (Birmingham)
B.8221. *Information on sugar-coating ball gums.* (London)
B.8223. *Formula for custard powder; baking powder; self raising flour.* (Cyprus)
B.8224. *Manufacturers of machines for making fish cakes, patties, etc.* (London)
B.8226. *Formula for synthetic vanilla essence for the baking trade.* (Worcester)
B.8232. *Manufacturers of chain and belt conveyors.* (Turkey)
B.8233. *Information on alginates in foods.* (Durham)
B.8234. *Information on canning soups.* (Australia)
B.8238. *Information on the uses of orange and lemon peel.* (Eire)
B.8240. *Formula for anchovy paste.* (London)
B.8245. *Recipe for dill cucumber pickle.* (Spain)
B.8246. *Information on bottling shellfish.* (Essex)
B.8248. *Suppliers of hydrogenated palm kernel oil.* (Scotland)
B.8249. *Formulæ for biscuits sweetened with dextrose.* (Belgium)
B.8260. *Information on piping jelly.* (Chicago)
B.8263. *Formulæ for dried soup powders.* (Bristol)
B.8264. *Manufacturers of smoked beef sausages.* (Scunthorpe)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

783,349. T. HUNTER, LTD.: Closures of jars, bottles and like containers.
783,364. A. MARINONI: Heat distribution apparatus for use with bakers' ovens.
783,428. BAKER PERKINS, LTD.: Swing or like trays for the conveyors of bakery units.
783,767. W. C. MENG AND L. Y. FONG: Carrier or holders for food containers.
784,235. BRITISH CELLOPHANE, LTD.: Production of artificial sausage casings.
784,232. ROSE BROS. (GAINSBOROUGH), LTD.: Manufacture of filled and closed bags.
784,416. C. W. AND C. BRABENDER (TRADING AS O. H. BRABENDER): Manufacture of an improving ingredient for baked products and of bread containing same.
784,525. POWLINGS PATENT PROCESSES, LTD.: Apparatus for mixing cereals and the like.
784,545. E. PIKELIN: Process for preparing fish meal.
784,555. STANDARD BRANDS, INC.: Pudding compositions.
784,601. VITAMINS, LTD.: Preparation of supplements for animal feedingstuffs.
784,948. A. CROFT AND G. HALLETT: Apparatus for applying edible fats to bakery dough.
785,057. SIMPLEX ELECTRIC CO., LTD.: Mounting arrangements for thermostats in ovens and other heated enclosures.

ABSTRACTS OF BRITISH PATENTS

Nut dipping device

This invention provides an apparatus which will allow centres to be dipped in batches in a coating material, *e.g.* nuts to be dipped in toffee, and which enables each batch of coated sweets to be readily removed from the dipping apparatus for subsequent cooling.

The device has a base with a number of recesses in which the centres to be coated are placed. A portable framework on which a sliding plate is mounted which carries a number of downward projecting pins arranged so that they can be positioned above the recesses in the base. An ejector plate is slidably mounted on the pins below the framework, and means for detachably connecting the ejector plate to the pin carrying plate are provided.

In use one centre is placed in each recess and the framework is placed on the base with the tapered ends of the pins engaging the centres. In this position the end extensions of the pin carrying plate are spaced above and apart from shoulders formed on the upstanding ends of the mould. Downward pressure on the pin carrying plate causes the pins to penetrate the centres, the shoulders preventing the pins from penetrating too far. The device is now lifted off the base and lowered into the coating material. When the centres are sufficiently coated the device is removed from the coating material, turned over and stood on rubber feet on the outer surface of the framework, thus bringing the loaded aperture plate uppermost. The latter can be removed by releasing the clips by which it is attached to the pin carrying plate, and allowed to cool.

In order to use the device again it is only necessary to attach another apertured plate and repeat the described operation.—775,696. *James Pascall, Ltd.*

Egg cleaning machine

An apparatus for cleaning eggs has a worm conveyor which rotates the length of the machine, the eggs being moved by the upwardly rotating side of the worm conveyor. An endless belt which passes through a water trough comes into contact with the eggs and wipes them as they are being moved along by the worm conveyor of the machine. Passing the end of the belt, which is made of towelling or some such material, the eggs meet another belt which is not immersed in water and which wipes the eggs dry. A bar is incorporated to prevent the eggs being thrown out of the worm conveyor.

The eggs are directed to a padded chute down which they roll to a platform for collection. Part of the platform is perforated, allowing a draught of warm air to dry the eggs. The air, which may be heated if necessary, is fed through a duct by a fan.—782,857. *J. R. McConnell.*

Coating jubes with sugar

A machine for coating jubes, jellies and similar confections with sugar consists basically of a horizontally rotating, open-ended drum. This contains one or more spiral ribs, which are set so that sugar can travel to the inlet of the drum, and which are provided with fins projecting towards the centre of the drum. An open-ended cylinder—made of sheet material at the inlet end and of perforated metal at the outlet end—is contained inside the drum extending from the fins through the outlet end of the drum. The cylinder also contains spiral ribs on its internal wall. Means are provided to deliver sugar to the machine and to direct sugar falling from the fins into the cylinder. The latter means comprises a ramp mounted on a frame on the discharge end of a jube deliver container, a right-angled flange on the outlet end of the drum, a flange on the inlet end set outwardly and obliquely towards the centre, a ring on the fins, a flange on the outlet end of the cylinder which registers with the corresponding flange on the drum and a flange on the inlet end. The last-mentioned flange is set outwardly and obliquely towards the centre and contains fins which register with the ring on the drum fins.

In operation, the jubes are fed on to a conveyor, softened and moistened as they pass through a heater and deposited in the rotating cylinder. The spiral ribs in the cylinder cause them to move with a rolling action, during which they are coated with sugar. As the jubes pass through the perforated part of the cylinder at its outlet end, the surplus sugar is shaken off.—775,210. *H. A. Faerber.*

Preserving fruit and vegetables

Fruit or vegetables may be preserved by a method in which a modified form of pectin (containing only 20-40% of esterified carboxyl groups) is dissolved in an aqueous liquid by circulating the liquid through a duct system having an inlet for the introduction of the modified pectin. The aqueous liquid contains sugar to the extent of 10-30% by weight of the final jelly weight. The pectin is fed in continuously or intermittently in powder or granular form to merge with the circulating liquid at such a rate as to avoid the formation of undissolved patches. A suitable salt of a divalent metal or other precipitating agent—calcium chloride or calcium citrate are good examples—is added while the temperature of the liquid is above that at which precipitation will take place and in such quantity as to avoid liquid precipitation taking place. The fruit or vegetables are then immersed in the aqueous liquid, which is cooled to precipitate and set the jelly.—781,568. *British Canners, Ltd.*

Vinegar manufacture

A new process of vinegar manufacture is claimed to include the preparation and use of an acetic acid bacterium which has not hitherto been identified. A pure culture of *Acetobacter operans* is obtained by plating out acetic acid bacteria which are in an actively multiplying condition, in a solidifying medium, which serves to separate the individual cells. The bacteria are incubated until visible colonies appear and the *Acetobacter operans* are selected by a defined technique. The *Acetobacter operans* are notable for their ability to produce acetic acid from an alcohol nutrient at an outstandingly high rate.

Vinegar is manufactured by acetification of alcoholic liquor using *Acetobacter operans* at a controlled temperature within the range of 75°-95°F., the apparatus and the equipment employed being sterilised before the operation begins. The alcoholic liquor is circulated through support material (birch twigs) carrying the bacteria at a speed such that the temperature rise between the top and the bottom is between 4°-6°F., the liquid being cooled before it re-enters the acetifier.

Sufficient air is introduced into the acetifier to keep pace with the rate of acetification which is obtained using *Acetobacter operans*. This speed, when using a nutrient medium containing sufficient alcohol, is not less than 20 kg. per cu. m. of ordinary beech wood shavings per 24 hr. at 30°C. A final acidity of not less than 9% acetic acid can be achieved.—781,584. *British Vinegars, Ltd.*

Abstracted from the Official Journal of Patents and from published specifications. These publications are available from the Patents Office, 25, Southampton Buildings, London, W.C.2.

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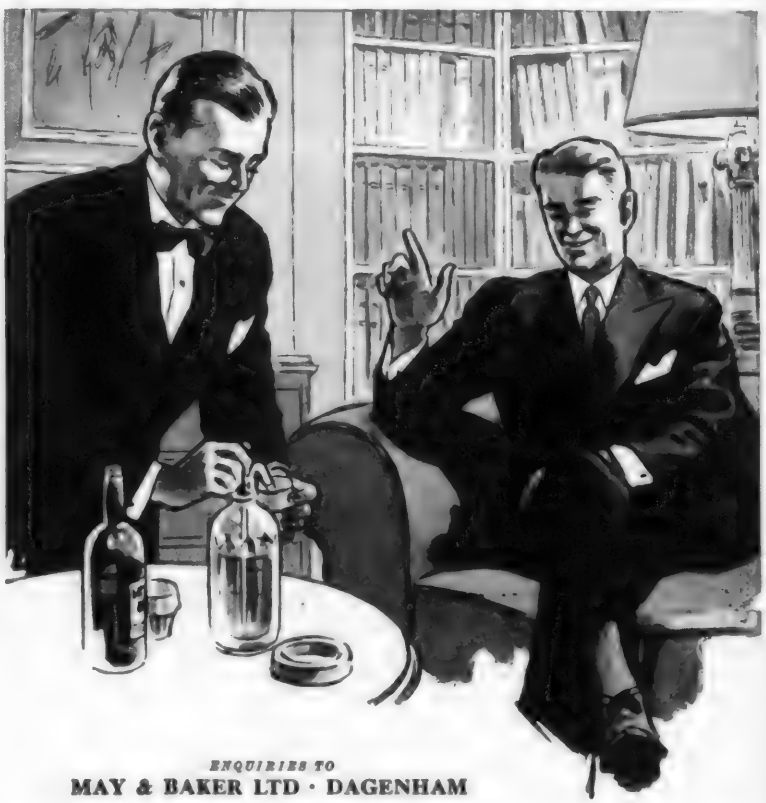

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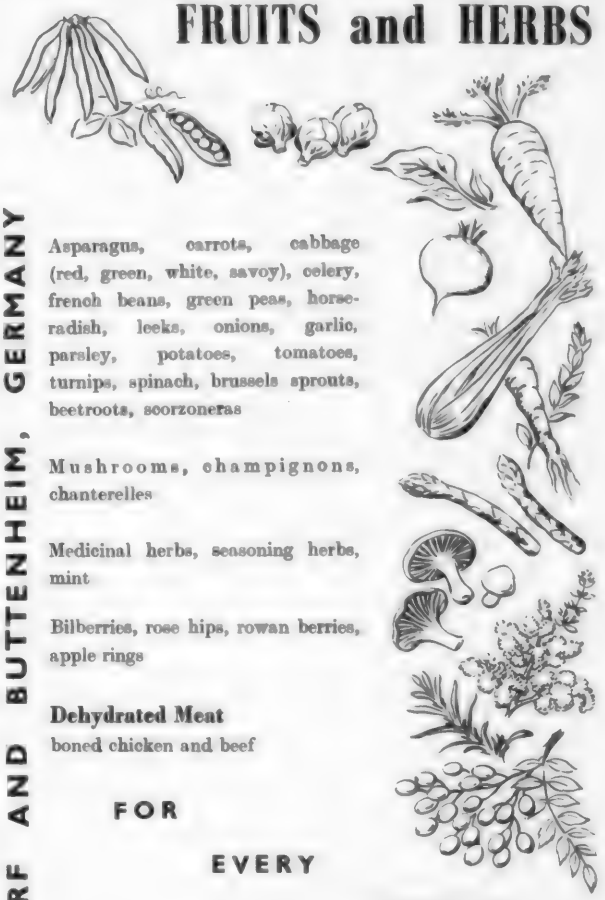

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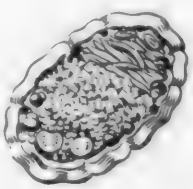

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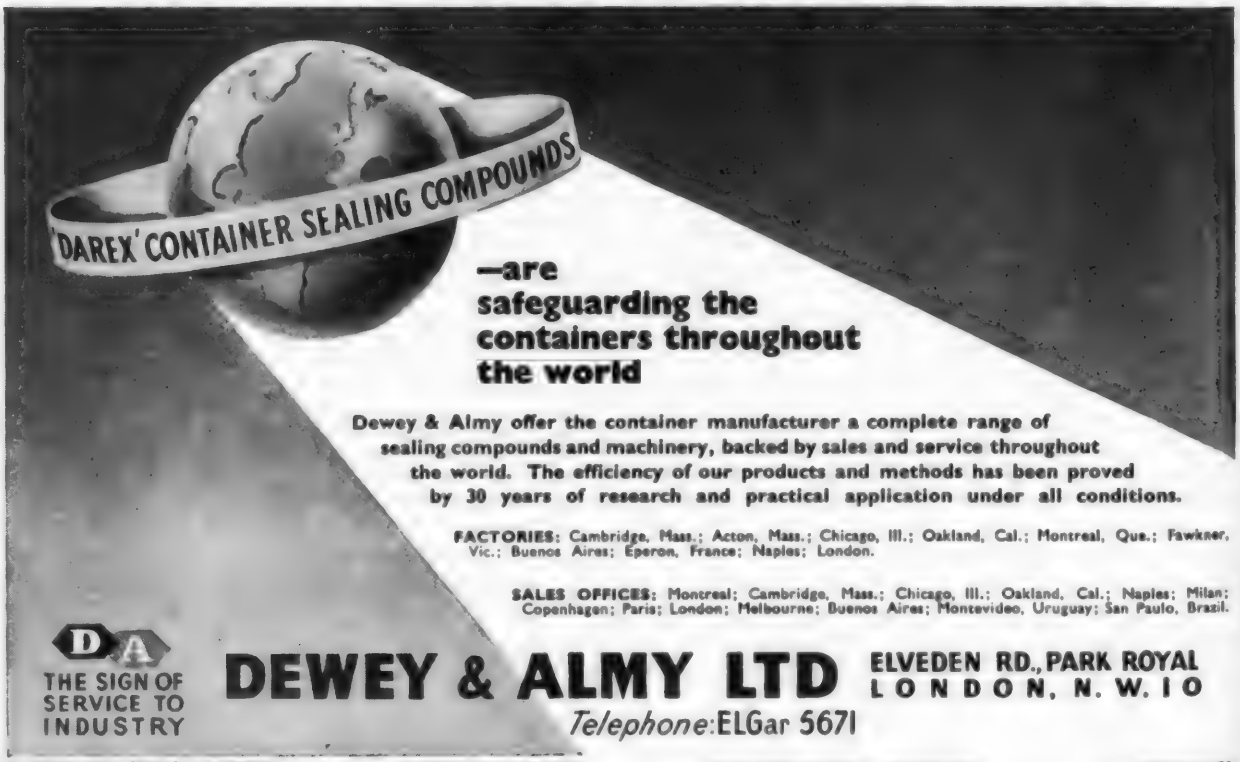

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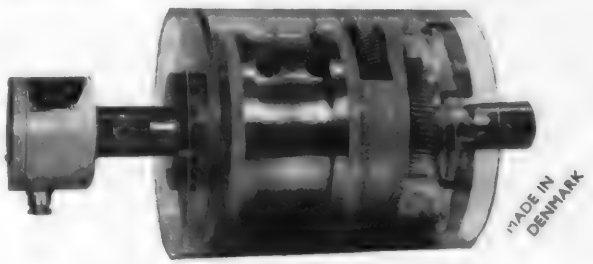

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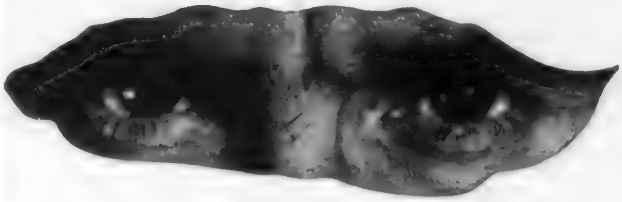

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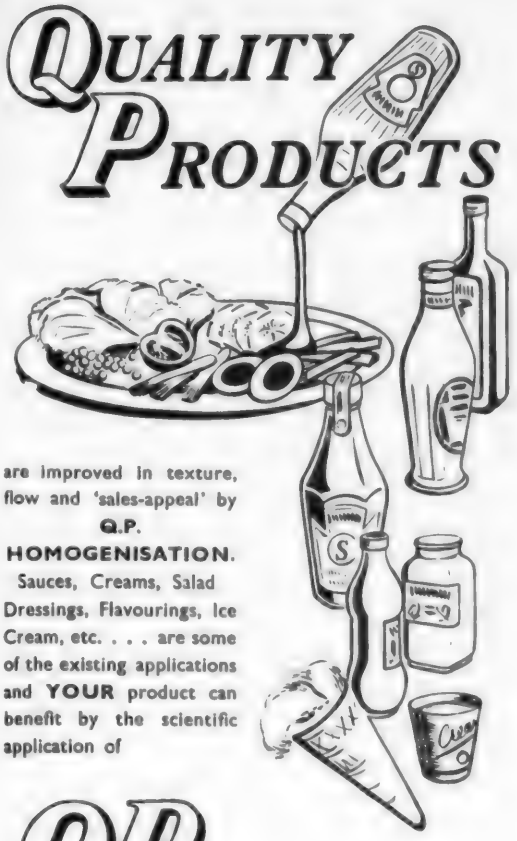

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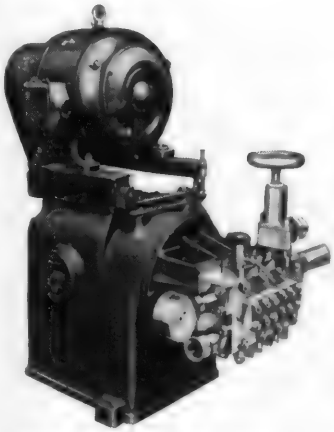

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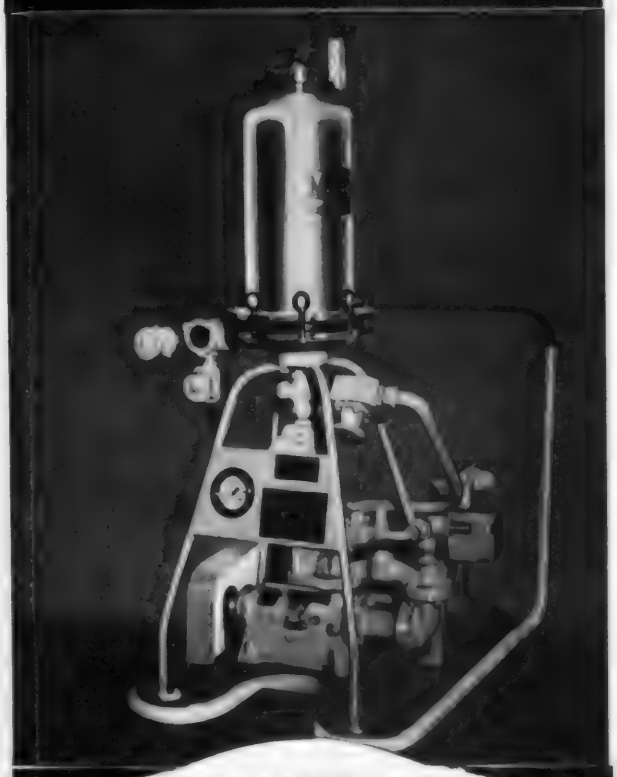

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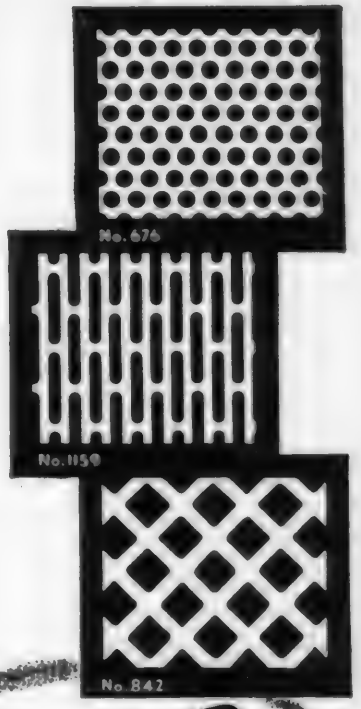

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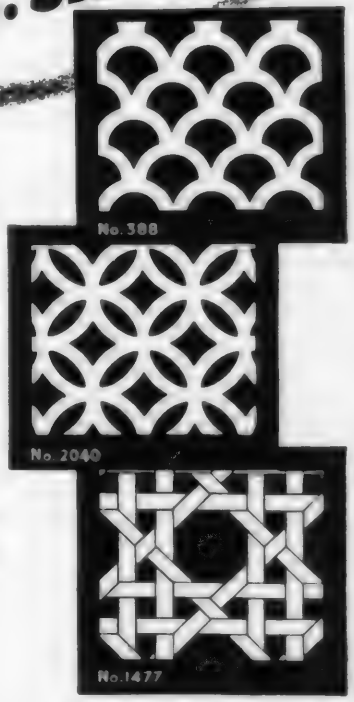

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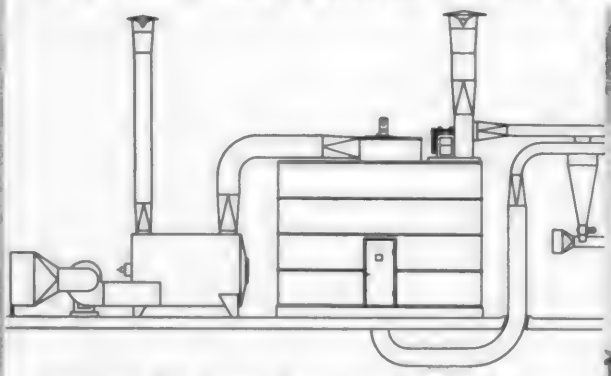

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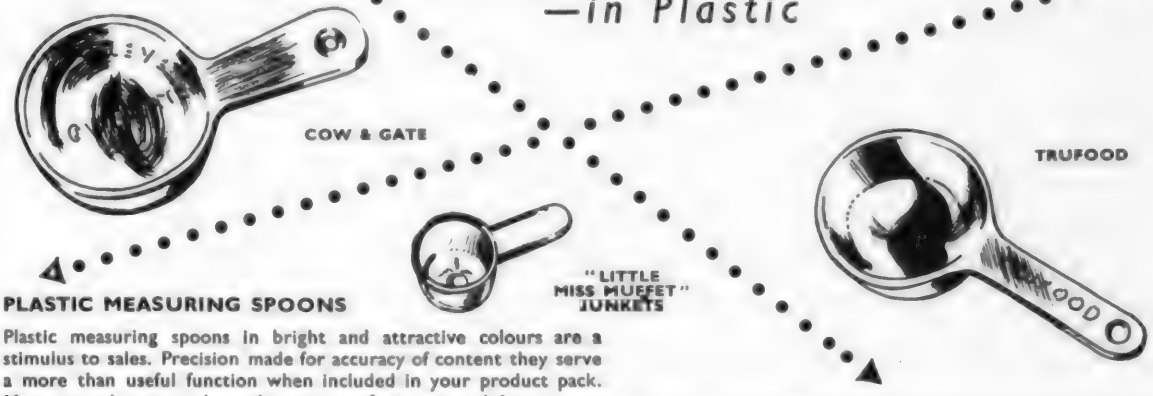

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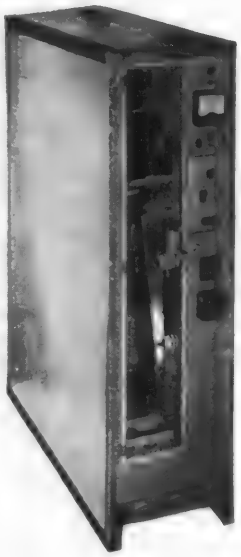

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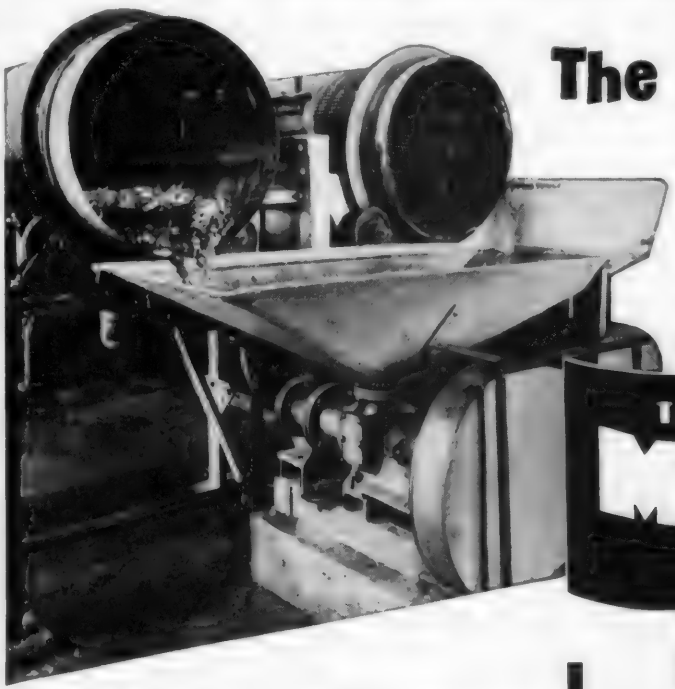

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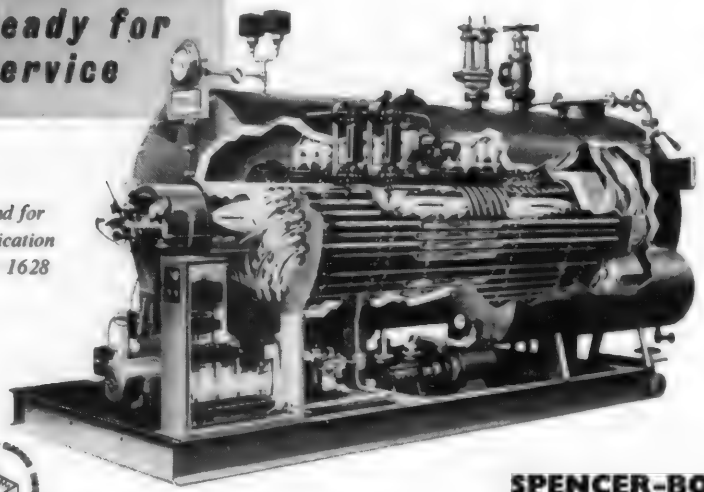

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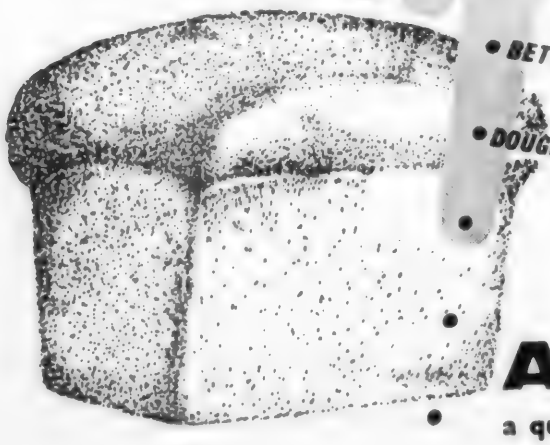

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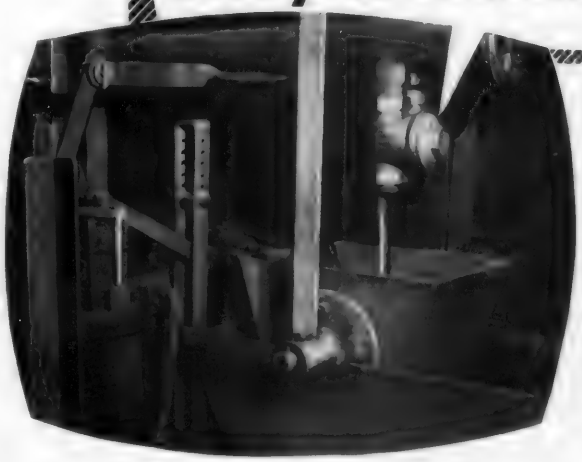

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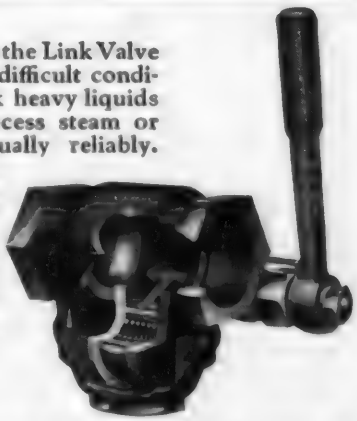

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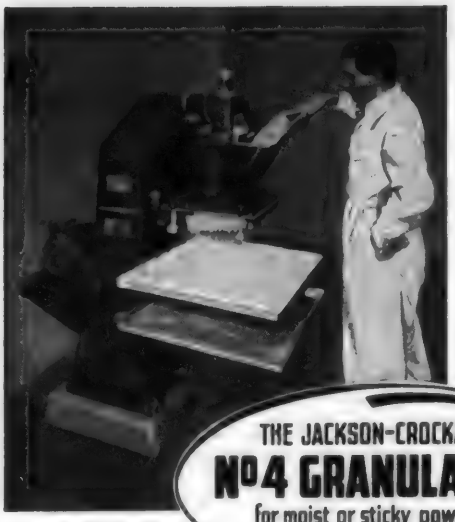

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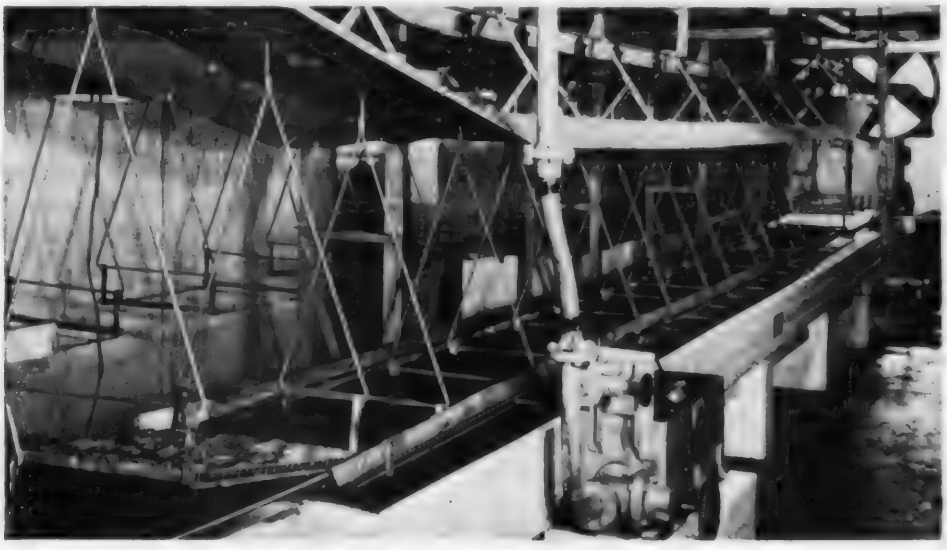

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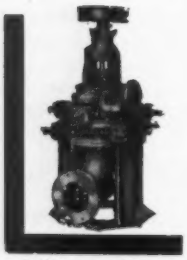

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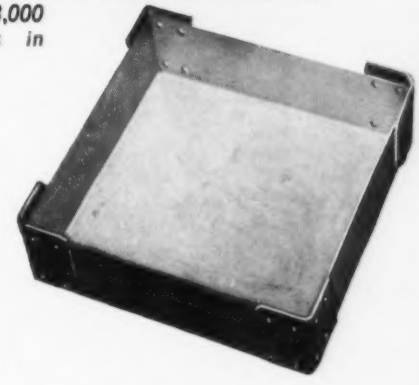

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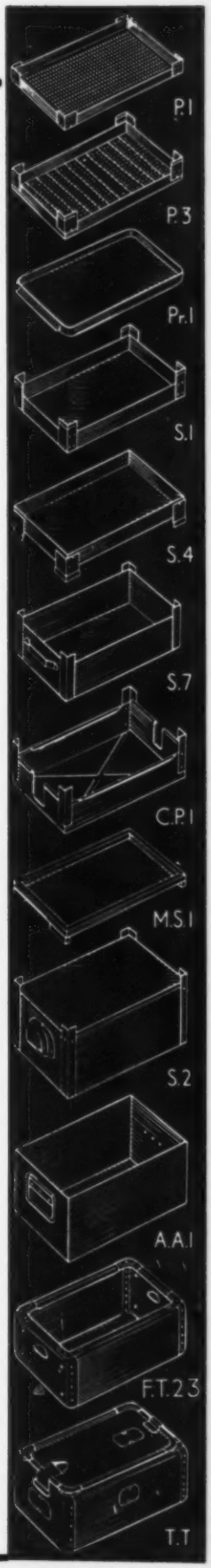
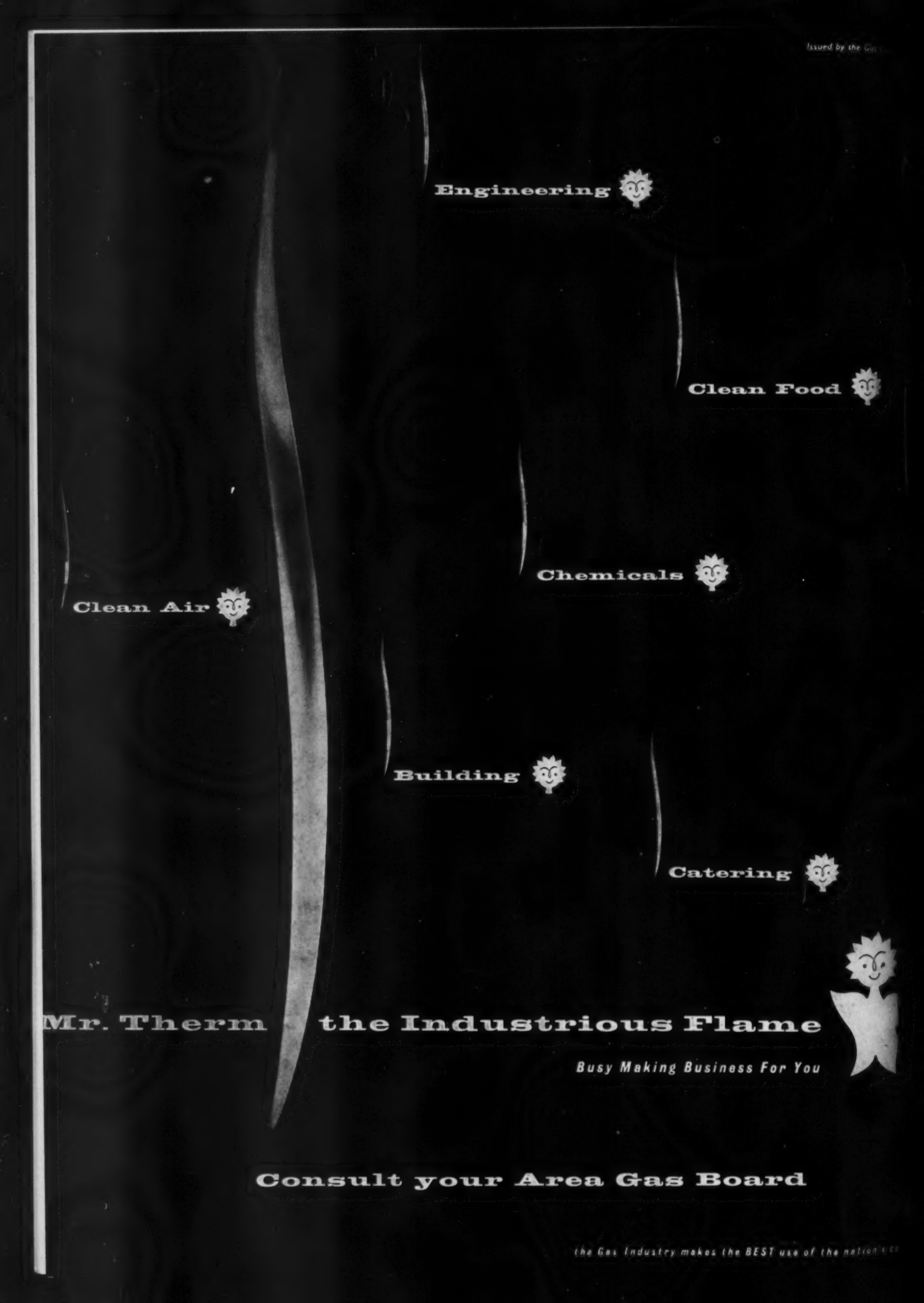
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